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Bedford Gardens 2007
PO Box 140
Bedfordview 2008

Tel: (011) 622 4770

Fax: (011) 615 6108

Editor: Peter Middleton

E-mail: peterm@crown.co.za

Advertising: Peter Middleton

E-mail: peterm@crown.co.za

Publisher: Karen Grant

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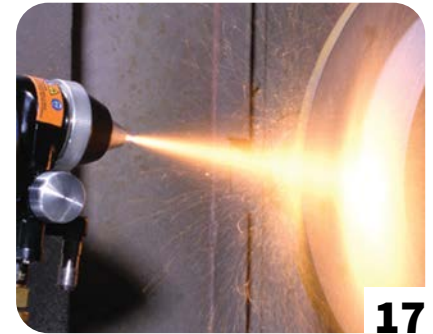
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Southern African Institute of Welding



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P Bruwer – SAQCC IPE

P Pistorius – University of Pretoria

SAIW and SAIW Certification representatives

Executive director

J Tarboton

Tel: (011) 298 2101

john.tarboton@saiw.co.za

SAIW Certification CEO

Herman Potgieter

Tel: (011) 298 2149

herman.potgieter@saiw.co.za

Training and technology manager

Mark Digby

Tel: (011) 298 2169

mark.digby@saiw.co.za

Executive secretary

Dimitra Kreouzi

Tel: (011) 298 2102 (Direct)

dimitra.kreouzi@saiw.co.za

Finance and administration manager

Michelle Warmback

Tel: (011) 298 2125

michelle.warmback@saiw.co.za



I am pleased to announce that the SAIW has now signed a MOU with South Africa's Nuclear Energy Corporation (NECSA) to establish a Nuclear School of Excellence in Pelindaba. The overall aim is to strengthen our national capability in non-destructive testing (NDT), with a special focus on the advanced ultrasonic phased-array (UT-PA) and time of flight diffraction (ToFD) methods.

The project will focus on the specific needs of the nuclear sector, which has had limited success in finding skilled NDT professionals. Also, though, this project will focus exclusively on recruiting and training women to take up careers in these advanced NDT techniques.

Historically, the number of South African women involved in NDT has been very low, with only 13.5% representation since 1980. Statistics taken from the start of 2021, though, show an improvement in these numbers, with 27% of all new NDT students now being female.

First and foremost, the project funding is to raise the number of women in NDT, so sponsorship is available for 10 people to be trained as Level 2 phased-array and ToFD NDT inspectors. So we are urging any woman who already has a Level 1 or Level 2 certificate in UT Inspection, or even an interest in NDT and a Matric Certificate with good results in mathematics and physical science, to contact the SAIW. This is a lifechanging opportunity.

Also on the NDT side, we have two gentlemen from Cameroon with us on the IAEA-sponsored NDT course. They are currently completing Level 2 qualifications in magnetic particle and penetrant testing with Jan Cowen, and doing very well.

The 20th World Conference on Non-Destructive Testing is finally taking place this year, after having been cancelled since COVID hit. It will be hosted by the Korean Society for NDT (KSNT) under the auspice of ICNDT and will be held in Incheon, South Korea during May.

We have also just finished Group I of our Sasol Training Programme, which started some 18 years ago as one of the original initiatives to develop NDT and welding inspectors for South African Industry: from Matric Level all the way through Level 1 and Level 2 NDT courses and then onto Weld Inspection courses. This programme even includes ASME Code courses and the Competent Persons qualification. We have been running these in alternate years, with most of the courses being conducted in various Sasol facilities. This last group of 20 started in January of 2023 and the training was completed by December.

Sasol continues to be very happy with the results of this programme and we are proud to have been chosen to partner Sasol in this important work. We look forward to starting the planning for Group J candidates for the 2025 year.

We have also been talking to UNIDO about a new group of Liberian Students coming to us as part of UNIDO's Youth Rising project. We trained about 11 Liberian welders in this programme in 2022 and we are expecting another eight or so, including women, to be spending approximately 28 weeks with us on the IIW International MMA Welder programme.

Because UNIDO has the United Nations' Sustainable Development Goals (SDGs) at its core, in addition to the International Welder qualifications, we have been asked to incorporate a welded construction project into the programme that, if implemented in Liberia, can easily become developmental in terms of jobs, the economy or the environment.

I am also pleased to announce that we have applied for an extension of scope for our SANAS 17021 certification for conformity assessment, which will enable us to certify companies to both ISO 3834 and ISO 9001. Unlike many other certification bodies, however, we will use two separate specialist auditors for these, so one does not end up diluting the other. We are very proud of the quality of our auditors.

John Tarboton

ESAB's new innovations for fabricators

Keith Saunders, product manager for cutting systems and PPE at ESAB South Africa, introduces three new product lines now available to South African fabricators: the Renegade eVolt battery powered welder; the Swift-Cut Pro CNC plasma cutting system; and the Cutmaster+ family of manual air plasma cutting machines.

“Our new ESAB Renegade VOLT™ ES is a portable, cordless, battery powered Stick (SMAW) and Lift TIG (GTAW) welder with the versatility to operate off built-in batteries, mains power or in AMP+ Hybrid Mode,” says Keith Saunders, product manager for ESAB South Africa. “This makes it ideal for welders operating in remote, offsite, or hard-to-reach locations without easy access to mains power,” he says.

When used as a cordless welding machine, the welder runs on 6 Ah, 9 Ah or 12 Ah DEWALT® FLEXVOLT® batteries, which provide exceptional power and runtime using patented technology that can automatically switch the voltage from 20 V to 60 V for powering more than 250 high powered cordless tools. “Using four 12 Ah batter-

ies, which are included in the Renegade VOLT 200i package, these batteries provide the power to consume up to 33 E6013 electrodes on a single charge,” he adds.

In AMP+ Hybrid Mode, Renegade VOLT supplements AC mains power with battery power to prevent nuisance trips on smaller breaker sizes – such as 10 A or 16 A breakers – or to enable welding to continue when load shedding kicks in. In this mode, the batteries can also provide additional welding output when welding. “What’s also nice is that, whilst the batteries are charging and if the power should come on, you can plug this directly into the wall and start welding,” Saunders continues.

Renegade VOLT features a rugged industrial design with durable, impact-resistant housing and multiple lift points



for effortless operation and transport in the field. The bright, intuitive colour-screen and user interface is designed for outdoor use, even in direct sunlight, and features a battery status display and remaining arc time calculator.

Special welding features include hot start, arc force, memory storage and a cellulosic (6010) mode to optimise performance based on the application or user preference. The 200i, for example, can deliver 200 A from a 230 V single-phase mains supply and up to 140 A on battery power.

“The system gives access to power when you have none and it can be used off mains power when you do have it, even when that power is unreliable. It is a state-of-the-art battery powered machine that is made for use in tough onsite environments,” he says.

Swift-Cut Pro CNC plasma cutting system

“The Swift-Cut Pro is part of our automation offering. The integrated systems are robust in design and are supplied with either a water or air extraction table and the ESABA120 or m2 200i plasma power source,” Saunders informs *African Fusion*. “The Swift-Cut Pro range offers high speed, precision cutting at a low investment cost. It is easy to use, simple to learn and operate, and we offer exceptional aftercare and support,” he says, adding that the range is industry’s ideal solution for affordable in-house plasma metal cutting and a water jet system, the Swift-Jet Pro, is also available for cutting materials such as ceramics and granite.

For fume extraction, the tables come in two variants – a water table or a fume extraction table – and typically use an ESAB Cutmaster A120 plasma cutting machine. ESAB is offering the tables in four cutting sizes: the 1250 Pro with a cutting envelope of 1.25×1.25 m; the 2500 Pro, 2.5×1.25 m; the 3000 Pro, 3.0×2.5 m; and the Swift-Cut 4000 Pro, which is suitable for cutting 4.0×3.0 m sheet sizes.

“The system comes with an ergonomic



ESAB's new Renegade VOLT™ ES is a portable, cordless battery powered, Stick (SMAW) and Lift TIG (GTAW) welder that uses four 12 Ah DeWalt batteries to provide enough the power to consume up to 33 E6013 electrodes on a single charge.

operator's console with touch screen and keyboard/mouse inputs, and easy-to-use SwiftCAM and SwiftCNC software included as standard. It takes less than five days to install and within two days of training an operator can be up and running with production cuts.

"The installation is uncomplicated and the programming software is easy to learn and use," he assures.

The new Cutmaster+ plasma cutter

The Cutmaster+ family of handheld plasma cutting machines has a new TFT display and a large single button control knob. "Inside, the system has been completely redesigned with attention to every detail, from how it's mounted to the case, how cooling air flows through it, and how the compressed air flows through the machine – all with a view to ensuring the electronics inside are far better protected," says Saunders.

"It is also far lighter and the costs have been reduced – and it can be used with older torches, so there is a saving for people who are already using ESAB plasma cutting systems," he adds.

Highlighting the features of the Cutmaster 70+, he says that this 70 A machine can pierce through 20 mm material to deliver a true cut finish, and from a plate edge it can produce a hand quality cut in 30 mm plate and a rough cut through thicknesses of up to 38 mm.

The Cutmaster+ family comes with the SL60 1Torch, which features the 2T/4T function, a safety trigger lock and double-tap trigger to conserve bottled air. It can accommodate switching between normal and grate cutting modes and includes post-cut air purge to expand consumable life.

"The Cutmaster Black Series consumables included in these systems offer up to 60% longer life. And for peace of mind, these systems come with a three year warranty on the plasma cutter and one year warranty on the torch, which is an industry benchmark," he says. "This really is a total plasma cutting package," Saunders assures.

This makes them ideal tools for general fabrication of steel structures; manufacturing and repair of products and components



The Cutmaster+ family of handheld plasma cutting machines has a new TFT display and a large single button control knob. It comes with the SL60 1Torch, which features the 2T/4T function, a safety trigger lock, and double-tap trigger to conserve bottled air.

such as automotive and truck bodies and agriculture equipment; and everyday plant maintenance and repair.

ESAB Richard's Bay

Having signed an ongoing agreement for the supply of ESAB AristoRod 12.50 welding wire to a large fabricator in Richard's Bay, ESAB is in the process of establishing a permanent presence there as an extension of its Durban branch. "We've employed new staff and secured a warehouse, and our new Richards Bay branch will be fully functional by April 1. We intend to carry stock from across our range there to help us service the whole area," Saunders informs *African Fusion*.

The non copper coated OK AristoRod 12.50 wire is a manganese-silicon alloyed solid wire for GMAW of general struc-

tural, pressure vessel, ship building and fine-grained carbon-manganese steels. High wire speeds and lengthy feed distances are made possible owing to ESAB's Advanced Surface Characteristics (ASC) Technology, which delivers improved quality and higher productivity.

"As a market leader in southern Africa, our growth has been exceptional and this is testament to our product quality and our service and support offering. The South African fabrication industry is tired of being sold cheap, unreliable equipment and consumables that cannot do the job. Our clients want robust, trouble free welding equipment and consumables that help them to raise their productivity levels, while overcoming the power issues we are all experiencing," Keith Saunders says.

"Rework is a business killer, especially in welding, and those who understand this no longer buy cheap," he concludes.

<https://esabsa.co.za>



The Swift-Cut Pro range offers high speed, precision cutting at a low investment cost. It is easy to use, simple to learn and operate, and comes with exceptional aftercare and support from ESAB SA.



SAIW's leap to a world class institute

February 2024 marked 50 years since SAIW and International Institute of Welding (IIW) stalwart, Chris Smallbone, first became a SAIW member. *African Fusion* and SAIW celebrate his inspirational contribution to the Southern African and global welding industry.

Chris Smallbone was born, raised and educated in Liverpool in the UK. "After completing my A-levels in 1964, I was selected for a student apprenticeship with the English Electric Company in Liverpool. The company paid for me to work for six months of every year and for the other six months I went away to a college for advanced technology in Stafford on a Municipal Council grant to study mechanical engineering," Chris Smallbone tells *African Fusion*.

After completing this five year programme, including practical training for later recognition as a Chartered Engineer, he did a Master's Degree in welding technology at the University of Aston in Birmingham supported by a Science Research Council grant. "Then a small fabrication company in Bolton wanted a young engineer to train as a junior executive. So, in September 1970, I moved to Bolton and began putting my training into practice in the fabrication industry, including training apprentices and welding technicians in the evening," he relates.

In 1972, industry in the UK started to be badly impacted by industrial unrest. Overtime boycotts and strikes were causing rolling blackouts across the country, and there was no end in sight. "We were convinced by some South African friends that South Africa was a land of opportunity, so in 1973, we started planning and then flew out from London to South Africa on Boxing Day," he says.

In September of that year, Chris Smallbone was offered a position at the WCATE as a senior lecturer in mechanical engineering, with responsibility – supported by SAIW – for building up the first South African welding technologist course. "I had to start from scratch, so the first thing I did was to make contact with the welding industry of South Africa," he says.

The SAIW, founded in 1948, was in 1974 a voluntary organisation, with one part-time secretary employed to arrange meetings and do the admin. "An evening meeting was held every month, which welding supply companies such as Afrox, Air Liquide, ESAB, Arc Engineering, Rockweld and Oerlikon, amongst others, supported, and a conference or welding technology school was

held each year. Operated by volunteers, branches evolved in Cape Town, Durban and Port Elizabeth, and once a year an annual dinner was held in Johannesburg, a tradition that continues to this day.

"With the help of these same SAIW members, I spent three weeks visiting companies during the holidays in April 1974 to get a feel for the industry and talk to bosses about their training needs."

In February 1974, 50 years ago, Chris Smallbone joined the SAIW as a member. By May of that year, he was elected to the Council of the institute and immediately became involved in IIW work – since SAIW had been a Founder member in 1948 – and his role in building the welding education and training side of the welding industry was immediately championed. By 1976 he was chairing the SAIW's education committee. And in 1977, he was one of the two vice presidents on the Council, becoming President in both 1978 and 1979. He also lectured voluntarily to undergraduate and postgraduate students at the University of Witwatersrand in Johannesburg during this period.

"A few of us on the Council started lobbying for full time staff and Phil Santilhano, who was the chief welding engineer for Vecor, was persuaded to become a staff member. Vecor was a world-class fabrication company involved in projects such as the Koeberg nuclear power station and the Pelindaba uranium enrichment plant as well as several steel manufacturing and power station projects," Smallbone continues.

Phil Santilhano became the SAIW's Technical Director and its first full time employee back in 1977 and, together with the three admin staff, worked out of an office in Braamfontein. "But then tragedy struck. Phil had a serious illness that put him out of action for most of 1979 and forced him to retire from the Institute in 1980. The only way the SAIW survived that year was through a series of seminars and workshops, which I and a number of other volunteers conducted, mostly out of the President Hotel, which was opposite the Wits-CATE college in Eloff Street," he says.

"As SAIW president in 1978, I mapped out a 12-year SAIW strategic plan, from 1979

to 1990, which included getting more staff into the Institute to deliver the services we felt industry needed. In 1979, George Murray, an SAIW Councillor, and I took this plan to the Minister for Manpower in Pretoria, who sent us over to see Chris van der Merwe Brink of the CSIR. He came back to say the CSIR would support the plan with R15 000 of funding per year for two years, equivalent to US\$15 000 pa at that time. In parallel, a visit to the MD of Iscor resulted in a similar amount of support. This support enabled me to have more confidence in leaving my secure position at the Wits-CATE and, on 1st January 1980, move to the Institute as Executive Director. "For the whole of 1980, I was hardly home at all. I was somewhere around the country running workshops, delivering courses, doing consultancy and trying to raise money for the Institute," he says.

"During that year, I took the 12-year plan to Michael O'Dowd, Chairman of the Anglo American and De Beers Chairman's Fund, who agreed to see me for 30 minutes. Anglo American was already very focused on corporate social investment, including education, training and upliftment of disadvantaged people and I had, in fact, already been given an award by the American Welding Society (AWS) for the work I had done in qualifying students as South African welding technologists and technician:

"Neither the SA Government nor industry would support building infrastructure developments at that time, but we needed better premises to continue to grow. So I presented my vision for a new SAIW building to Michael O'Dowd and his team and asked for R600 000 of an estimated R2.5-million total cost to get it started. I was sure we could raise the rest of the money if Anglo American was onboard.

"O'Dowd promised to bring it up at the next meeting and let us know. I spent two weeks on tenterhooks, then I phoned Mr King the manager of the fund. 'Oh, yes', he says, 'we had our meeting. Let me see what the board says'. He rustled some papers then said: 'Yes, we will give you R600 000. I'll confirm it in writing next week'. We were jumping up and down in the office. My job was then to secure the rest of the money, which included Anglo-American raising its



contribution to R1.0m in 1983,” Smallbone recalls.

So the SAIW City West facility was built and equipped, and while it has been expanded and modified several times since, it remains the flagship SAIW facility to this day, adds Smallbone.

“In the interim, I heard that the UK Inspection authority company, British Engine, was closing down its NDT facility in Spartan. I asked its MD to lease us the premises with a couple of small offices for use as an SAIW training school, and to purchase some of the redundant NDT equipment. I then did a presentation to Southern Cross Steel Board members and senior managers. As long as I kept them informed, they said, they would underwrite expenses of up to R250 000 towards our overall plan. So we bought the second-hand equipment, leased the facility, painted it and employed two excellent people, Keith Williams and Dick Pendrill to deliver SAIW NDT Training programmes at the Spartan facility,” he relates.

Turning back to the SAIW building, he says it was designed by the Anglo American Architectural Department, in part to reflect the welding and metal fabrication industry. “So it was built from structural steel, with aluminium shuttering around the outside – all donated by Hulett Aluminium – and when it came to the stainless steel, as a nod to Middleburg Steel’s support, we used stainless steel for all the urinals. We did everything we could to keep industry involved and onboard,” says SAIW’s first Executive Director.

The City West SAIW practical welding centre in Johannesburg was opened in February 1985 by Leslie Boyd of Anglo American before the second phase had started. Chris Smallbone then visited the parent companies of key welding equipment suppliers overseas, along with local steel and welding consumables suppliers, for donations to fully equip the facility. Hundreds of unemployed people were then given free training and the opportunity to find employment and improve the quality of life for their families.

“We were then able to persuade the Minister of Manpower and the Urban Foundation for loan-based funding to complete the second phase, which was subsequently repaid by SAIW through earnings, illustrating the success of the Institute’s business operations and the excellent team work,” he tells *African Fusion*.

“The second phase was opened in 1986 by Piet du Plessis, Minister of Manpower. We moved in with many second-hand run down desks, office and training equip-



A view of the SAIW City West facility in Johannesburg after completion in 1988.

ment but gradually built up to a first class establishment.

A few of the other key successes which Chris Smallbone and the teams of staff and volunteers were involved with during his tenure as Executive Director at SAIW 1980 to 1993 included:

- The initiation, formation and management of voluntary boards and committees with high profile individuals from industry, government and academic organisations.
- The creation of an international network of people and companies leading to excellent support from them for industry through SAIW international conferences, industry study missions, seminars, workshops, training and technical support, amongst others.
- The establishment and management of the SAQCC (NDT) and SAQCC (IPE) national bodies that successfully delivered unified qualification and certification of personnel structures across the NDT and inspectors of pressurised equipment fields in South Africa to world class standards.
- Setting up national welding skills competitions in South Africa, helping establish and voluntarily manage the Skills SA Foundation in 1989 and leading a fully multi-racial South Africa delegation and team with Nigel Fitton into the International Skills Olympics in Taiwan in 1993.
- Securing funding from various sources such as the Canadian, Dutch, Australian and South African governments and industry to train disadvantaged people in welding, welding inspection and NDT for careers and employment on projects such as the Moss gas offshore gas project.

From 1980 to 1993, the numbers of students trained on the full time SAIW courses he introduced was into the thousands.

Students were also examined, qualified and certified to 13 SAIW and SAQCC national programmes implemented from 1980, each of world class standard and involving industry experts.

The establishment of the Welding Industries Training and Technological Fund and the SAIW Technology Board, SAIW Centre of Welding Technology and SAIW Centre of NDT Technology

From having only a single part time employee when he became an SAIW member in 1974, by the time Chris Smallbone left in 1993, the SAIW staff complement had risen to 49.

Significant welding industry honours and awards won by Chris Smallbone include: the SAIW Gold Medal Awards in 1979 and 1987; the SAIW Harvey Shacklock Award in 1992; SAIW Fellow and SAIW Honorary Life Member awards.

He is an IIW Fellow and has won the highest IIW award, the Walter Edström Medal, for his ‘remarkable and distinguished contributions to the IIW and the international community’.

He left the SAIW after having been invited to lead and grow the Welding Technology Institute of Australia (WTIA). With similar enthusiasm and persistence, he built it up to be an internationally recognised organisation prior to his retirement as WTIA CEO Emeritus in February 2014.

Internationally, Chris Smallbone has played many pivotal roles over the past 50 years, including being President of the IIW from 2005 to 2008. He continues to be actively involved in promoting welding and the IIW across the globe and is particularly passionate about improving the quality of life for all through projects such as The Importance of a Country’s Welding Industry, Its National Welding Capability (NWC) and their Significance to the UN Sustainable Development Goals (SDGs). ■



Lifecycle solutions for steam generators and critical industrial plant

African Fusion talks to Dhurusha Chetty and Elbert Cilliers of Babcock Africa’s engineering business about the company’s ISO 3834-driven approach to meeting the critical fabrication and asset management needs of South Africa’s critical power and industrial infrastructure.

Dhurusha Chetty, the Welding Engineering manager at Babcock and the responsible Welding Coordinator for several Babcock ISO 3834 accredited fabrication and onsite maintenance facilities, is one of few South African women to have chosen Welding Engineering as a career. “I hold the position of welding engineering manager at Babcock, where I also serve as the company-wide ISO 3834 Responsible Welding Coordinator,” she tells *African Fusion*.

Having graduated as a mechanical engineer from UKZN in Durban, Chetty started work as a trainee for Transnet Port Terminals before transitioning to Transnet Engineering. “My introduction to welding came when I took on the role of a responsible welding engineer involved in implementing EN 15085, the ISO standard governing welded railway vehicles. I was responsible for overseeing all welding-related tasks in the local production of underframes, bogies and other components for Bombardier and CNR locomotives,” she explains.

Having been introduced to the world of

welding and working beside international welding engineers to come up with ideas and solve production related challenges, Chetty decided to pursue a career in welding. “Subsequently, I pursued an Honours programme at the University of Pretoria and obtained certification as an International Welding Engineer (IWE) through the SAIW. Following that, I furthered my education with an MSc degree at Wits, with a specific emphasis on welding metallurgy,” she relates, adding that she joined Babcock to assume the responsibility for the company’s ISO 3834-2 certification in July 2023.

“Ensuring the highest standards of welding quality is a top priority for us, and ISO 3834 plays a crucial role in maintaining these standards consistently. Whether it is the welded fabrication within our workshops or providing on-site support for power stations and other industrial sites, every welding procedure and related activity revolves around ISO 3834. We fully



Dhurusha Chetty, Welding Engineering manager.



Elbert Cilliers, head of Engineering.

embrace ISO 3834, recognising it as an excellent means to deliver the quality, safety and longevity required for the critical plant systems we fabricate and maintain. Rather than avoiding it, we see ISO 3834 as an integral aspect of ensuring the excellence of our welding practices,” explains Chetty.

“And Babcock’s engineering business has been certified to ISO 3834 Part 2 since 2013,” Elbert Cilliers, Head of Engineering points out.

Continuing, Chetty says that, unlike generic standards such as ISO 9001, ISO 3834 ensures that welding “nitty-gritties” are properly controlled: such as material and consumable control and management; welding machine verification and control; welder qualifications; and traceability. “So, it’s an integral part of our day-to-day work across our business,” she assures, adding that this applies in full, albeit with some small variations, for both inhouse new fabrication work as well as onsite maintenance work during a shutdown project.

Babcock has responsible personnel available for several different certified sites. “At any given time, we hold five ISO 3834 certificates, tailored to the locations where we undertake welding-related contracts. In addition, we uphold certifications for all our own sites consistently and continuously,” she says.

On her choice as welding as a career, she says that it has always been about passion: “Whether you are male or female in the industry, it is about having a passion for what you do. For me, I found that within welding. I enjoy the job and the challenges that come with it. It is sometimes difficult being in an industry that is male dominated, but you can always face challenges by proving



Babcock Africa’s first fabrication facility was opened in Jet Park in 1993.



what you know. I sometimes need to work a little harder to prove myself, but at the end of the day the guys in the industry respect that.

“At Babcock, I have been welcomed by people who have been working here for years. The company is very accommodating: of various cultures and genders, which makes my job a lot easier,” she adds.

On the role of female welders in the industry, Chetty says there were several female welders working for Transnet on the fabrication of railway components. “There were notably skilled TIG welders among the team, but the challenging conditions in the power generation environment, especially on-site, can be uncomfortable, potentially deterring women from pursuing opportunities. It would be encouraging to see greater female involvement in this field, nonetheless,” she responds.

On the training side, Elbert Cilliers, Head of Engineering, says Babcock has a welder training and testing bay that is a mock-up of a typical tube bundle welders might find in a real steam boiler. “To train and qualify welders, we have a test rig where we mirror the complex boiler environments, particularly focusing on confined spaces and challenging positions where welders must work to complete their tasks. This approach effectively distinguishes high-quality welders from average ones, as we assign the most skilled welders to these demanding areas where repair needs may be frequent. During shutdowns, we strategically rotate welders based on their performance to ensure we meet the highest quality standards.”

Regarding current contracts, Cilliers notes that Babcock is actively involved in various projects within the power generation sector. These include projects such as high-integrity welding of auxiliary steam pipes, valve replacements, repairs to pulverized fuel burners, maintenance work on coal mills, which primarily involve structural welds. Additionally, we are engaged in the replacement of HP and IP turbine loop piping, which encompasses the pipes spanning from the emergency stop valve to the HP turbine inlet. The HP systems operate at around 170 bar and 540 °C, underscoring the critical importance of producing high-quality welds. The potential consequences of a failure in these systems would be catastrophic,” he informs *African Fusion*.

Babcock is currently undertaking an upgrade on electrostatic precipitators at one of the power generation sites. This project involves a considerable amount of welding associated with structural steel



Above: Babcock specialises in high-integrity welding that often needs to be done in confined spaces.

Right: Welding of a stubhead for a power station refurbishment.

and ducting. “We’ve consistently been involved in industrial projects as well. For instance, at sugar mills, we are currently performing crucial high-pressure welding on boilers. We often undertake boiler work and shutdown operations at sugar mills during their off-crop season,” he says, adding that Babcock Africa engineering also does boiler work in the power sector outside of South Africa.

In the pulp and paper industry, Babcock recently completed mainsteam piping welds, and for the petrochemical industry, the company has been busy since 2017 on a capital project to install new low NOx burners for emissions’ abatement. “That project includes a fair amount of welding associated with small bore piping systems,” adds Cilliers.

“Overall, we specialise in high-integrity welding, actively pursuing projects and maintenance contracts across various industries involving pressurised systems and boilers. This capability forms the cornerstone of our expertise. Babcock stands out as the only company in the nation to have successfully executed a complete Mainsteam system replacement on two power generation units, accomplishing this feat in record time. These projects demanded the highest calibre of engineering, quality, and welding proficiency, particularly in working with materials such as X20CrMoV11-1 and ASME A335 P91. Pressure vessels, a realm we have not actively engaged in, also present a viable opportunity for us. Our adaptable and transferable skills from our current work on boilers and piping make us well-equipped to deliver into this domain,” he notes.



On the process development side, Dhurusha Chetty says that Babcock is always on the lookout for more efficient and cost-effective welding solutions. The fabrication shop, for example, has now developed and internally approved a pipe welding procedure that uses Miller’s Regulated Metal Deposition (RMD) and Pro-Pulse welding machine to complete the root and the capping welds of piping joints, replacing the need for a TIG root pass and capping runs using stick electrodes. RMD is a type of modified short-circuit metal transfer welding process used in gas metal arc welding (GMAW). “Lincoln has also developed and improved on a similar technology with its PipeFab Power Source, and we hope to adopt these developments in the near future.

“Through initiatives such as these, we can offer an efficient and reliable procedure that is not only quicker and more cost-effective but also minimises waste in consumable usage. The utilisation of semi-automated processes is beneficial given the skill level available in the country. Achieving high-quality welds is more attainable with a welder using the semi-automatic GMAW process compared to the challenge of training them to produce welds of high integrity using a combination of TIG and stick welding,” Dhurusha Chetty concludes.

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Spearheading global welding skills across the continent

SAIW recently empowered four Tanzanian students with internationally recognised IIW International Welder certificates. One of the successful candidates, Opodi Ezekiel, highlights the skills needs in Tanzania that is driving this initiative.

The Southern African Institute of Welding (SAIW) is proud to announce the successful completion of core modules of the International Institute of Welding (IIW) international welder course by four pioneering Tanzanian students. This milestone not only underscores the SAIW's position as the only institute in Africa offering this globally recognised qualification but also highlights its commitment to 'train the trainers' a crucial step towards advancing welding skills across the continent.

The four students embarked on the IIW course at the SAIW's Johannesburg campus in September 2023 to gain the advanced welding skills necessary to train other Tanzanian welders to meet the demands of major international projects in their country.

Opodi Ezekiel, Patrick Bandali Ngailo, and Manfred Michael Mapunda all work for the Vocational Education and Training Authority (VETA) while Erick Suitbert

Nkuna works for the Don Bosco Training Institute. They have now completed their courses and received the relevant training certificates.

Local projects, local skills base

The backdrop to the need for these types of welding skills is Tanzania's burgeoning economy underpinned by its wealth of natural resources, including oil, gas, and minerals. The development of these resources is driving a growing demand for highly skilled welders. Tanzania, however, lacks the domestic capacity to meet this demand and is often forced to rely on foreign welders.

Opodi Ezekiel explains; "The problem

is local welders are not qualified to participate in the international projects that are taking place in Tanzania. Fortunately, by completing the IIW international welder course at the SAIW, we have gained the knowledge and skills necessary to train



Four students from Tanzania, Opodi Ezekiel, Patrick Bandali Ngailo, Manfred Michael Mapunda and Erick Suitbert Nkuna, have successfully completed the IIW International Welder (IW) course as part of the SAIW's train-the-trainer programme.

Can professional welding engineers contribute more?

This article by SAIW Honorary Life Member, Tony Paterson, calls for a certification system for South African welding engineers, based in a peer-review recognition system, in order to raise the status of Welding Engineers to global Professional standards.

In an earlier contribution, I noted the inter-disciplinary nature of the welding sector. Welding is an enabling technology through which complex structures can be assembled from a relatively small number of standard shapes and flats. The boundary spanning role between disciplines falls to the welding engineer.

This role is not often seen. The potential role of the Welding Engineer seems confined. Mark Twain apocryphally said: "I am in favour of progress. Its change I don't like." This underscores the human tendency to desire progress and growth without the hard work that comes with it. We have introduced internationally accredited theoretical training for Welding Engineers without any following initial or ongoing tests of competence or evaluations of appropriate experience.

This surprises me as other countries do have such systems. Locally the approach developed by SAIW Certification for ISO 3844 to support major end users with initial and ongoing accreditation of

companies as competent at differing levels of fabrication is sensible. These are not replicated for Welding Engineers. Why? I don't understand the apparent omission.

Professions are normally registered as a means of protecting the public. Initial registration as competent requires an accredited theory course accompanied by structured experiential exposure, this, locally, regarded as part 3 of Engineering training. Part 1 covers the basic sciences, Years 1 and 2 of a degree; Part 2, the engineering specialty chosen, Years 3 and 4. Once a PrEng, always a PrEng is not the case. As the PrEng serves both to protect the public and to inform other professionals of competence within a specific skill area, ongoing involvement is monitored.





The comprehensive training received at SAIW covered advanced welding techniques, safety standards, and the critical importance of following precise welding procedures.

other welders to this high standard.

“This opportunity also took us to South Africa so we could have an education that will, first, be internationally certified when we get the certificate and, when we return home, we’ll train other Tanzanians at this international level,” he explains.

Ezekiel further emphasises the importance of the IIW certification. “International projects require certified welders. Without this certification, our local welders cannot participate in these high-profile projects”. This sentiment was echoed by his peers, who highlighted the comprehensive

training received at SAIW, covering advanced welding techniques, safety standards, and the critical importance of following precise welding procedures.

Training the trainers

Overall, the SAIW is committed to playing a leading role in developing the welding skills of the African workforce. The institute’s train-the-trainers programme provides experienced welders with the necessary skills and knowledge to train others.

The graduation of the four Tanzanian students is therefore a significant milestone for SAIW’s train-the-trainers programme. It demonstrates the Institute’s ability to provide high-quality welding training that meets the needs of the African continent.

The programme’s success is a testament to SAIW’s excellence in welding training and its role in empowering African nations to develop their own skilled workforce. SAIW Welding School Manager, Confidence Leokane comments; “This initiative is not just about enhancing the skill set of individual welders; it’s about building the capacity of African nations to undertake their development projects with their own people.

“We aim to ensure that the continent’s wealth of natural resources and infrastructure projects can be developed with local talent, reducing reliance on international workers,” she says.



The skills and knowledge that the Tanzanian students have gained at SAIW will have a ripple effect, as they return to their home country and begin training other welders.

A ripple effect

What is clear is that the skills and knowledge the Tanzanian students have gained at SAIW will have a ripple effect as they return to their home country and begin training other welders. This will help Tanzania develop its domestic welding workforce and reduce its reliance on foreign workers.

As a result, the SAIW looks forward to continuing its role in this transformative initiative, working towards a future where Africa’s welding professionals are internationally certified, highly skilled, and fully equipped to contribute to the continent’s development projects.

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Once awarded, the PrEng registration is limited to five years. It is maintained by adequate ongoing experience and exposure to current theory to keep up to date via the continuing professional development (CPD) system. As ECSA holds a listing of currently registered professionals, they can be consulted about people who are currently registered as accredited. The PrEng accreditation can also be removed for proven unprofessional conduct.

Albert Einstein once famously said “Information is not knowledge. The only source of knowledge is experience. You need experience to gain wisdom.” It is this wisdom that professional recognition seeks to represent. As noted above, it surprises me that Welding Engineers, as a group, do not appear to feel the need to be registered as competent. Speaking to fellow professional engineers involved with structures underscored the feeling that Welding Engineers were broadly regarded as simply senior welders.

The debasement of the word ‘engineer’ was highlighted to me in an input to a local group chat: ‘Looking for a household engineer/domestic assistant. No live in.’ Metallurgists have been protected by their specific descriptor. This skill descriptor protection does not apply to Engineers or to Welding Engineers, in particular. Whilst their cross-disciplinary training makes them potentially extremely useful in terms of manufacturability, as an example, this seems not to be recognised.

So, if one considers formal and ongoing registration, where

would one seek to be recognized? To those who work in this country the Engineering Council of South Africa (ECSA) route seems sensible. Professional registration requires an ECSA accredited Engineering undergraduate degree as does the IWE. The content to these degrees is closely monitored and controlled by ECSA. To those who seek the possibility of overseas work, meeting the IIW accreditation is worth considering, possibly alongside the CEng (UK) – or similar for other overseas countries where the IIW system applies.

To me, the latter seems more relevant both locally and internationally. The reason for this is that locally trained engineers, be they Physical Metallurgists or structural engineers – mechanical or civil – can register as PrEngs. As the PrEng is not specific-skill centred, it seems more appropriate to seek to meet the C(chartered) IWE experiential requirements, thus demonstrating a centred multidiscipline skill set.

How do we manage this? Whilst the local representative of the IIW, the SAIW, can develop and manage systems, as SAIW Certification has for ISO 3834, the primary responsibility lies in the body of IWE graduates. If believed relevant to broad recognition of professional competence, pressure can be exerted on SAIW to develop such a peer approved system.

This brings me back to Mark Twain and the human tendency to desire progress and growth without the hard work that comes with it. ■

A comparison of weld bead geometry for CMT, pulse MIG and standard synergic MIG under cryogenic conditions

This paper from the 76th IIW Annual Assembly and International Conference on Welding and Joining (IIW 2023) in Singapore is by Yashwant Koli and S Aravindan who investigate the bead geometry of ER4043 (AlSi5%) filler wire deposited on the AA6061-T6 (3.18 mm) sheet in cryogenic conditions using three fusion welding techniques: cold metal transfer (CMT) welding, metal inert gas pulse (MIG-P) welding, and metal inert gas standard synergic (MIG-SS) welding.

Industries are shifting towards light-weight materials, which can considerably reduce transportation costs and energy consumption. Aluminium alloys are replacing steel in the majority of applications such as aircraft components, external and internal vehicle body parts, railway industries, etc, due to their high strength, low weight and exceptional corrosion resistance^[1-4].

Gas metal arc welding (GMAW) is commonly used for joining aluminium alloys having higher thickness due to its higher heat input characteristics, greater penetration depths, and confined heat-affected zone (HAZ)^[5]. Despite these benefits, residual stresses and distortion are unavoidable in GMAW welds. These occur during welding due to non-uniform thermal expansion and contraction induced by localised transient heating and non-linear temperature profiles.

These problems can be reduced by using a low heat input welding process such cold metal transfer (CMT). This process is an upgraded technology based on the GMAW process patented by Fronius of Austria. It works on the short-circuiting mode of metal transfer where, at the time of short-circuiting, the current drops to a very low non-zero value, which reduces the heat input and avoids spatter generation^[6]. CMT

can, therefore, be used to join sheets as thin as 0.3 mm thick.

Various research studies have been done in cryogenic conditions during friction stir welding or processing (FSW/FSP). But only limited work has been done with CMT welding. Sudden cooling or quenching will refine the microstructure. During the process of quenching, the rate of cooling can have a significant effect on the degree of supersaturation, which in turn affects precipitation hardening. The FSP studies incorporate cryogenic cooling to enhance the mechanical properties of aluminium alloys by refining grain size^[7].

Weld parameters directly affect bead dimensions, determining weld quality^[8,9]. From a comprehensive review of the literature and preliminary experiments, it is evident that current and welding speed are the two most influential factors on bead dimensions and shape relationships^[4,10]. Weld bead geometry consists of weld penetration (WP), weld reinforcement (WR), weld width (WW), weld dilution (WD), and contact angle (CA).

This paper focuses on the variation of weld bead geometry with and without the use of liquid nitrogen cooling (LN₂). Three processes (CMT, MIG-P, and MIG-SS) are compared using the same parameters for thin AA6061-T6 sheets.

Experimental Procedure

Materials:

For this research work, AA6061-T6, was used as a substrate sheet with dimensions of 100x60x3 mm. ER4043 (AlSi5%), having a 1.2 mm diameter, was used as a filler wire. Due to high compatibility with 6000 series aluminium alloys as per literature and trial tests. The chemical composition of AA6061-T6 was experimentally obtained by chemical spectroscopy as per ASTM E 1251:2011. The substrate AA6061-T6 material used was found to consist of Si-0.665%, Mg-0.840% and Al-97.75%, while ER4043 filler wire consists of Si-5.6% and Al>94% as the major elements^[4].

Figure 1 (a) shows the microstructure obtained using an optical microscope of the substrate sheet, while the elements (Al, Mg, Si) confirmation is given by the EDX graph depicted in Figure 1 (b).

Methodology:

TPS 400i CMT welding machine setup was used with a liquid nitrogen hose pipe attachment, as shown in Figure 2(a). Extensive trial experiments were conducted, and the optimised process parameters were achieved using a 90 A current level and at welding speed of 7.5 mm/sec with CMT using response surface methodology (central composite design)^[11].

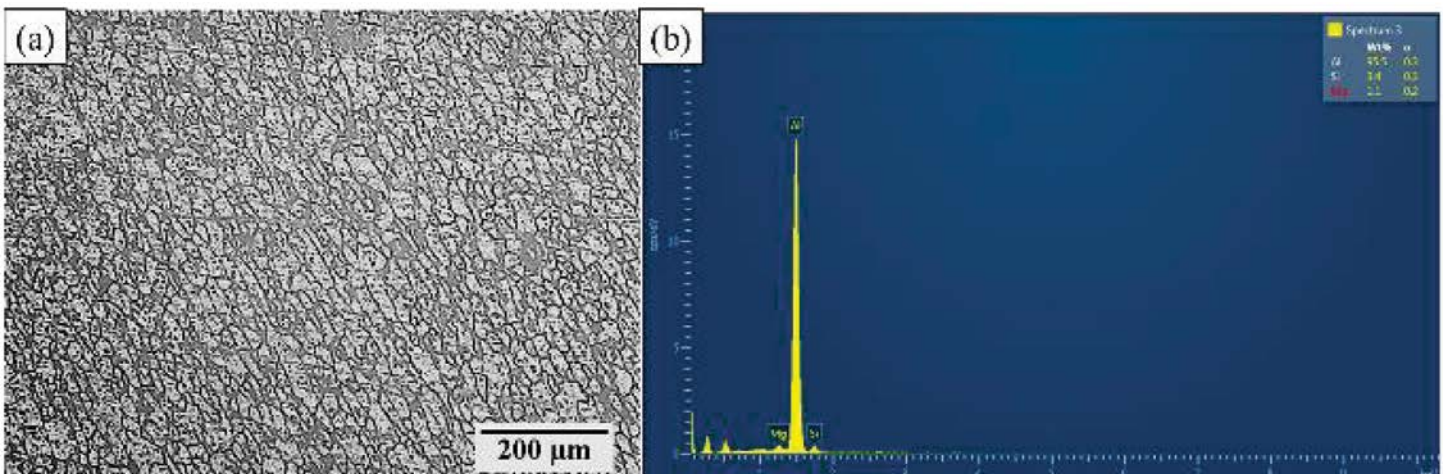


Figure 1: AA6061-T6: (a) Optical microscopy (OM) image; (b) EDX graph.

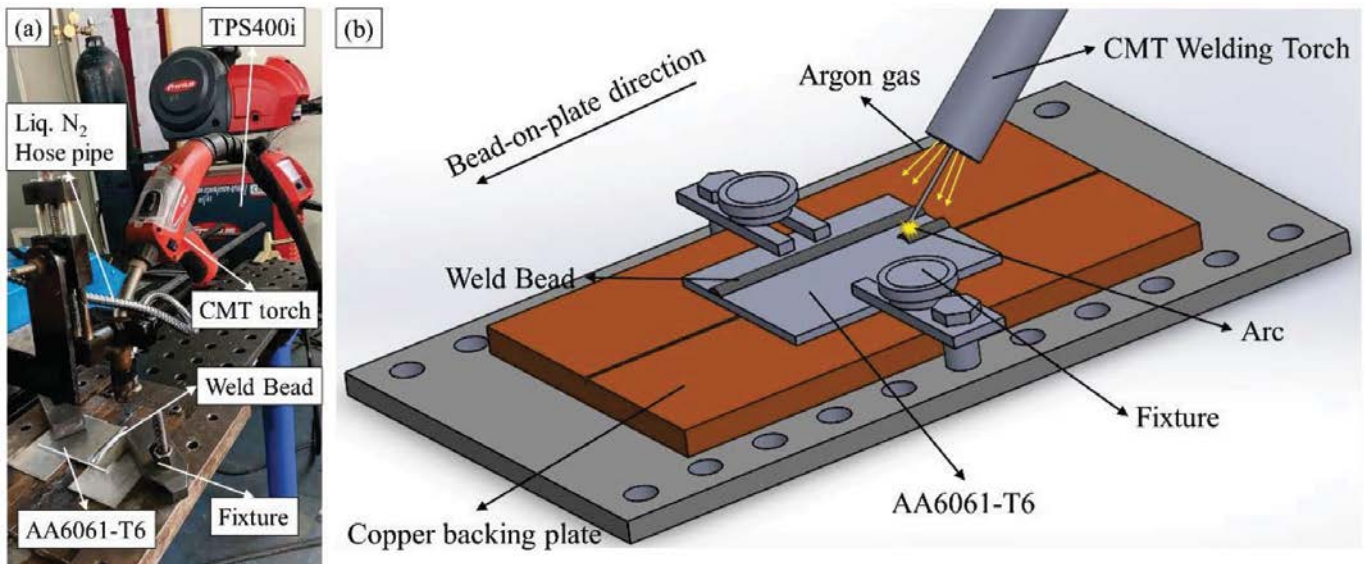


Figure 2(a) CMT machine setup; and 2(b) Schematic view of fixture.

This work is an extension of recently published work reported^[4,11], which examines the effect of liquid nitrogen during bead-on-plate experiments. The liquid nitrogen hose pipe is attached adjacent to the CMT welding torch, as shown in Figure 2(a). The substrate sheets were cleaned with acetone and a wire brush before the experiments to avoid contamination. The cleaned substrate sheet is fixed in a fixture, as shown in Figure 2(b).

The CMT torch is kept at 90° while the stick-out distance was held at 5 mm. Pure argon gas at constant flow rate 15 l/min was used. The process parameters were set at 90 A current and 7.5 mm/sec of welding speed for all three welding processes, as shown in Table 1.

Heat input (Q) is essential terminology in the welding process' It is dependent on voltage, current and welding speed, as shown in Equation 1. Dilution (WD) is quantified as the ratio of the areas of weld penetration (WP) and the total weld bead area, which consists of the sum weld penetration and the weld reinforcement areas, as shown in Equation 2.

$$\text{Equation 1: } Q = \eta \frac{VI}{s}$$

$$\text{Equation 2: } WD = \frac{WP \text{ Area}}{WP \text{ Area} + WR \text{ Area}}$$

Where Q it the heat input; V, the voltage; I, current; s, welding speed, and η is the thermal efficiency, which was kept constant at 80%^[12].

Results and discussions

Three welding processes with the same parameters were analysed with and without the use of liquid nitrogen. Figure 3 shows the weld bead profile of all three welding parameters with and without LN₂.

	I (A)	V (V)	WFR (m/min)	WS (mm/sec)	Q (J/mm)
MIG-SS	90	18.4	5.3	7.5	282
MIG-P	90	18.9	4.2	7.5	220
CMT	90	16.6	4.1	7.5	207

Table 1: Experimental table with process parameters and weld conditions: Shielding Gas – Pure Argon (15 l/min); MIG-SS – MIG standard synergic; MIG-P – MIG pulse; CMT – Cold Metal Transfer; Contact Tip to Workpiece Distance (CTWD) – 10 mm.

It was observed by visual inspection that MIG-SS has a more comprehensive bead profile with major cracks on the surface of the bead without the LN₂ conditioning. With the incorporation of LN₂, these cracks were avoided on visual inspection.

The other processes, MIG-P and CMT, had good welding aesthetics without cracks in both conditions. As shown in From Figure 3, a specimen was extracted from each weld, and the cross-sectional surface was polished with emery paper ranging from 220 to 2 500. Furthermore,

the specimen is polished with alumina paste on velvet paper and etched with Keller's reagent to reveal the bead profile and microstructure.

Figure 4 shows the macroscopic images of weld bead geometry for all three-welding processes at the same process parameters. ImageJ software was used to measure the weld bead geometry and dilution % with the help of the macroscopic image.

Table 2 shows the measured values of the weld bead geometry. Overpenetration was observed in MIG-SS and MIG-P w.r.t the

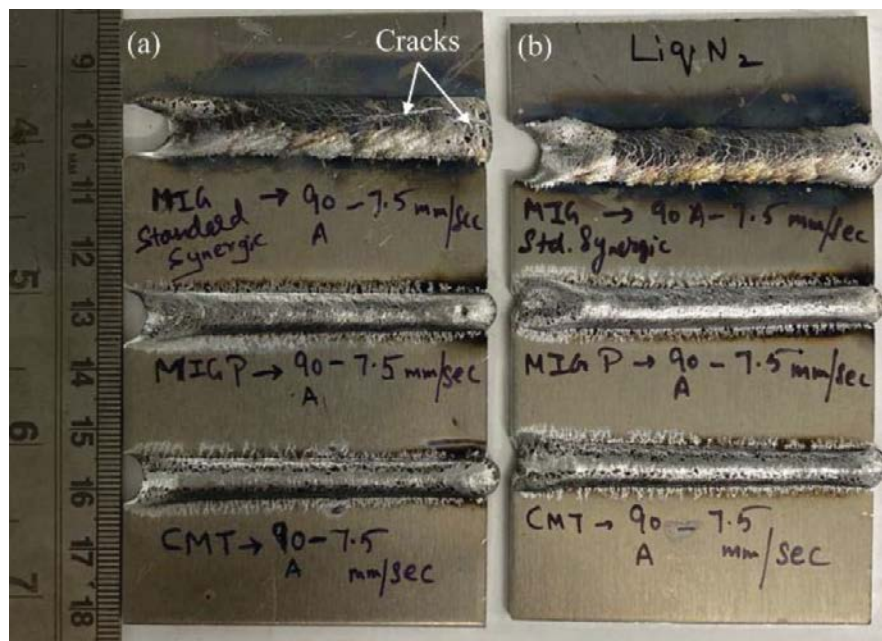


Figure 3: Weld bead profile of different welding techniques: (a) without LN₂ (b) With LN₂.

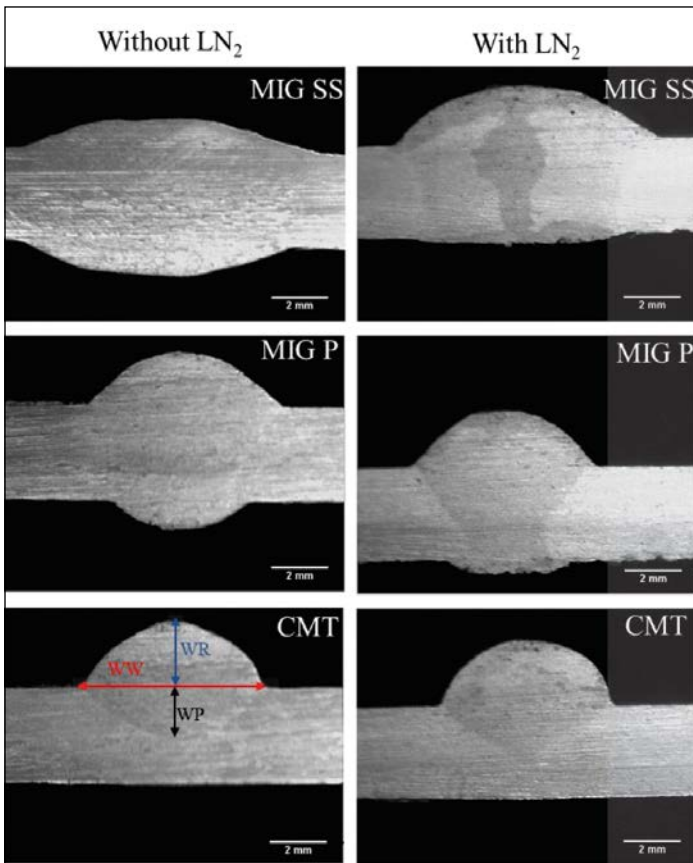


Figure 4: Macroscopic images of the three different welding techniques with varying conditions at the same process parameter.

substrate sheet thickness due to the high heat input welding process compared to CMT. Maximum penetration (4.432 mm) is observed with the MIG-SS welding process, while a minimum (1.848 mm) is observed in CMT due to low heat input characteristics.

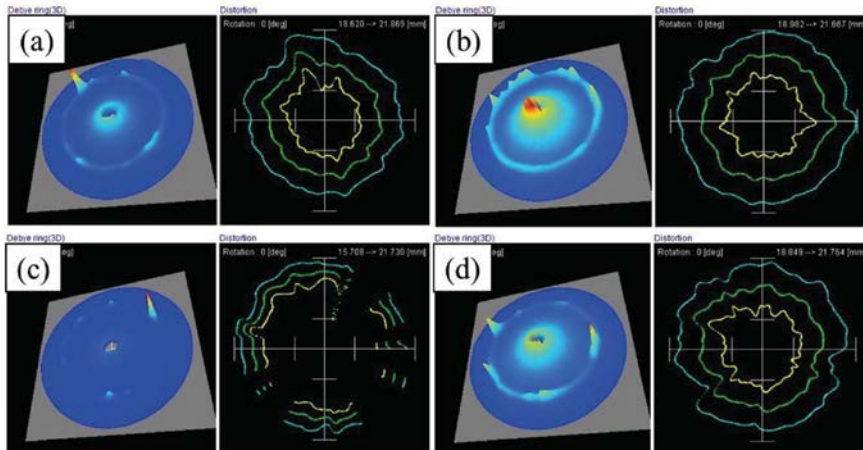


Figure 5: Residual stress graphs comprising of Debye Scherrer ring and distortion plots (a) CMT without LN₂ (b) CMT with LN₂ (c) MIG-SS without LN₂ (d) MIG-SS with LN₂

Several researchers working on the effect of cryogenics on welded aluminium alloy specimens reveal that it helps in grain refinement, has better mechanical properties, and mitigates residual stresses and distortions^[5,7,13,14]. In this work, as the LN₂ hose pipe was connected adjacent to the welding torch, the LN₂ was sprayed over the solidus form of the weld bead, creating a much better effect as compared to cryogenic post-weld heat treatment (PWHT).

With the help of spraying LN₂, it was observed that the sheet distortion was minimal as compared to ambient conditions. It also helps in the sudden cooling of the weld bead, which reduces the weld width, as shown in Figure 4.

Dilution % is also observed to be reduced in all three processes with the effect of LN₂, as shown in Figure 4 graph. This states that the weld penetration decreases while increasing the weld reinforcement during solidification. While using LN₂, the % reduction in dilution is 19.10% 13.87% and 8.93% for MIG-SS, MIG-P, and CMT, respectively. The maximum reduction in dilution is experienced in MIG-SS due to its high heat input characteristics.

A Pulstec-X360n Full 2D High-Resolution x-ray Diffraction (HRXRD) machine was utilised to measure residual stresses in the CMT and MIG-SS weldments. It is based on the Cos α method (Bragg's Law), which acquires a complete Debye-Scherrer ring (which reveals grain orientation (texture) and grain coarsening, etc.) with a single short x-ray exposure from a 2-D detector^[15].

The residual stresses measured in CMT and MIG-SS weld bead without LN₂ are:

$\sigma_x = -91$ MPa, $\sigma_y = -160$ MPa; and $\sigma_x = -138$ MPa, $\sigma_y = -505$ MPa respectively, as shown in Figure 5.

The comparative numbers below show the significant effect of LN₂ in reducing the residual stress:

$\sigma_x = -68$ MPa, $\sigma_y = -89$ MPa and $\sigma_x = -103$ MPa, $\sigma_y = -395$ MPa for CMT and MIG-SS, respectively.

Figure 5 shows the Debye Scherrer ring and distortion plots at the CMT and MIG-SS weld beads. It is observed that the maximum residual stress is observed in MIG-SS (without LN₂), as shown in Figure 5(c). The % reduction of residual stress is around 25.27% and 44.375% in the x and y direction, respectively, for CMT weld beads. In comparison, the % reduction of residual stress is about 25.36% and 21.78 % in the x and y direction, respectively, for MIG-SS weld beads with the application of LN₂.

Conclusions

The effect of liquid nitrogen on weld bead geometry in three welding processes using the same process parameters was investigated in this research. The main results are as follows:

		Weld bead dimensions				
Condition	Process	WP (mm)	WW (mm)	WR (mm)	WD (%)	CA (°)
Without LN ₂	MIG-SS	4.432	10.615	1.108	83.31	21.073
	MIG-P	4.348	6.775	1.885	71.59	42.731
	CMT	1.848	6.625	2.333	41.76	49.145
With LN ₂	MIG-SS	3.695	9.299	1.960	67.39	42.757
	MIG-P	3.602	6.569	1.997	61.66	45
	CMT	1.941	6.084	2.295	38.03	68.962

Table 2: Weld bead geometry and contact angles.



1. Using liquid nitrogen during fusion welding gives crack-free bead aesthetics.
2. Liquid nitrogen helps suppress the weld bead geometry, especially weld width, making it denser and void-free due to sudden cooling.
3. MIG-SS is observed to have a maximum % reduction in dilution when using liquid nitrogen cooling due to its high heat input characteristics compared to the other welding process.
4. Compared to the other welding processes, CMT has the best weld bead aesthetics, optimal dilution % and no over-penetration with and without the effect of liquid nitrogen cooling.
5. Liquid nitrogen helps reduce residual stress by 25.27% and 25.36% during CMT and MIG-SS in the x-direction, respectively.

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The 7 Habits of Highly Effective Thermal Spray Operators

Excellent, consistent coatings are not an accident. They are produced by highly effective thermal spray operators, says Bob McDemus, AKA, The Thermal Spray Guy. In this article he outlines the habits that make these people effective.

If you read this short piece and say to yourself, “This was so basic that it was a waste of time,” congratulations! With that being said, you cannot believe how often I observe that these fundamentals are missing in the shops I visit. The result is wasted time, money and effort on rework and scrap when it could have been avoided.

If you read this and say to yourself, “Sounds nice, but we don’t have time for that stuff,” I would simply ask; how much time do you spend on rework or making excuses for sub-standard results?

What is the cost of rework and scrap in your operation? If you do not have a specific number that you measure each week, you do not know. What is the cost of the operator walking around looking for tools, materials, or answers to questions? These are hidden costs that are often not measured and result in lost profit margin.

The overall description of highly effective operators is that they are organised, have procedures, which they follow, for everything. And they follow the procedures, they ask questions for clarity, and they clean up after themselves. This is unpacked in detail below:

The first habit is being organised. Effective spray operators have their own tools that add confidence in getting jobs done. These will include hand tools to do minor equipment maintenance and adjustments to a set-up, and micrometres that are calibrated and readily available. These operators never have to wander around the shop searching for tools.

I have visited some shops that have tool boards with the specific tools in designated areas so there is a visual organisation that makes it easy to see when something is missing. This is a little more difficult in an area that has multiple operators and multiple processes that occur on a regular basis. A solution for this situation could be the creation of an ‘Area Czar’, a person assigned to a specific area to keep it organised and clean. If anyone disrupts their territory, the czar has the authority to correct the situation. The highly effective operator is held accountable to execute the discipline

needed to keep all tools organised, and challenges everyone else to do the same.

The second habit is keeping the work area clean. Before starting a job, they organise and clean the work area. These operators cannot tolerate clutter and dirt in the area being used to spray world class parts. Similarly, the area is cleaned up after completion of the work or at the end of the shift, because the person following is also a world class operator who wants to work in a world class environment.

There are various sources of oil and water in a spray shop. The obvious ones are the machining and grinding lubricants, which can be oil or water based. These are necessary for completing any pre-spray machining but are a problem when it comes to getting a good bond for a thermal spray coating. We recommend processing all parts after machining through a degrease operation before continuing to the grit blast operation.

I have visited shops that are satisfied with using the grit blast as the degreasing operation. It reminds me of kitty litter; it will absorb oil, but once it gets saturated, it will transfer oil to the surface you are grit blasting. Do not use your grit blast cab as



Wire flame spraying of steel.

a kitty litter tray. Although this is inconvenient, it will lead to a better track record for best practice.

By far, the biggest source of oil and water contamination is from the compressed air source. Many shops use older piston compressors that put oil into the compressed air. And unless you are in the desert, you will get water from condensation forming in the normal air. Coalescing filters will do an adequate job of removing the water and oil, but they must be sized correctly. They must be sized for the maximum output of the compressed air system, not just for use with the thermal spray process.

It is best to have a filter isolated for the use of the thermal spray torch and any cooling air that you may need for the operation. Be careful to size the filter for both the thermal spray torch and the cooling air. The highly effective operator will stop all operations if he sees contamination of the compressed air.

The third habit is having procedures for each job, and the same procedures must be



Wire flame spraying of zinc.

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used by all operators in the shop. Pre-spray inspection procedures give confidence that the operator knows exactly what needs to be done. When work comes in, fundamental tasks that are documented in the procedures need to be completed.

The effective operator works in an environment that has a workflow record that maps out exactly what is to be done to a part through the entire shop. First, each operator must verify that all preceding procedures have been completed and documented.

The effective spray operator is going to verify that the starting size he has received is correct; and what the finish spray size and surface finish will be after the finish machine or grind operation. In a job shop environment this is important because operations in the thermal spray area can have a significant effect on the finished part.

The highly effective operator works from written instructions. Those who work from verbal instructions and assumptions tend to generate more rework and scrap.

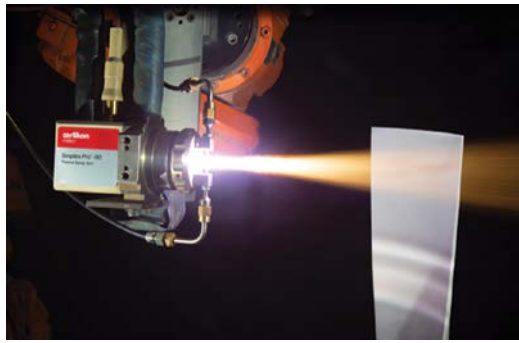
The fourth habit is consistency. The work that effective operators are given will always deliver the specified outcome, based on the same written procedures any other operator would use to do the same job.

It is very typical for operators to have their 'own way' of doing things. That is a disaster waiting to happen. The complete information of how the job is going to be done should be always with the part. Specific detailed operational procedures should be at specific operation areas, but the total job scope information must stay with the part.

Available documents must clearly define the order in which operations are to be completed. Operators also need to verify that each previous step of the process has been completed before beginning their operations. And verification is needed following each completed step of the operation.

Several documents are required to complete the job:

1. The traveller: a document that follows the job throughout the shop to describe what operations have to be completed. The order is clearly defined along with any special instructions for individual operations.
2. Operational instructions: These are specific instructions for specific operations. They include details of what the parameters are for that operation.
3. Inspection instructions: These specify



Robotic plasma spraying of an aircraft gas turbine blade.

the requirements for the completed operations, finish dimensions, surface finish requirements or any measurable characteristic of the part or operation.

To be effective, the operator must be trained in the proper procedures, and have access to complete support documentation.

The fifth habit is surface preparation.

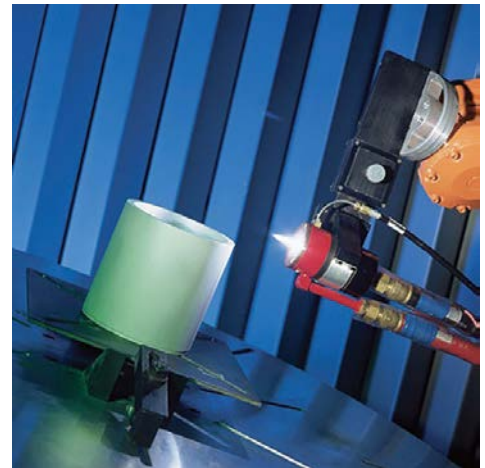
The surface preparation and the cleanliness of that surface is one of the most critical steps in the spray coating process. This is especially relevant with the repair of components that have been in service. Very often with a used cast and machined component from an industrial environment, oil will be absorbed into fine porosity that is inherent in castings. This porosity is so fine that normal degreasing operations will not remove the oil. The porosity can be deeper than 0.015", so even if you pre-machine before spray, you may still have some trapped oil.

During the thermal spray process, the casting will commonly heat up to 100 to 150 °C and the oil will weep out of the porosity because of normal expansion, which can cause delamination of the coating. Elimination of this problem is straight forward: heat that part to about 350 °C, and any oil that is trapped will weep out and burn up. An indication that you have achieved this is there will be no more smoke coming off the part.

Grit blasting is another critical step for a successful thermal spray operation. A typical surface finish from machining is a 63 Ra (roughness average). This is too smooth for good adherence for most thermal spray processes. A 300 to 400 Ra is far more suitable for a good grit blast surface. A 'white metal' finish is needed, a finish with enough 'nooks and crannies' to enable good bonding.

Important blasting parameters include Grit size; Grit type; Service life of the grit; Blast working distance; Nozzle size; Air pressure; and Blast angle.

The sixth habit is following the specific spray parameters. Every time the same job



Robotic plasma spraying of a pump sleeve.

comes into the shop, effective operators do the spraying in exactly the same way, and every operator in the facility will use the same parameters as defined on the operational instructions for that specific part.

Spray parameters include any measurable attributes of a spray coating operation, speed of rotation in rpms, plus or minus x rpms, for example. But an instruction like "turn it pretty fast", is not a measurable spray parameter.

Some other examples of spray parameters are spray distance; rotation speed; feed rate; and the power settings, which will vary depending on the thermal spray system, but define the total energy of the system. Power settings could include voltage; current; gas type; gas flows; gas pressures; or any other parameter that affects the total enthalpy of the heat source. Other parameters include powder feed rates; wire feed rates; coating thickness pre-pass; gas and air pressures and gas and air flows.

In all cases, the parameters must be clearly defined with specified value ranges and units of measurement.

The seventh habit is accountability. Effective thermal spray operators inspect and take responsibility for their own work. The correct finish spray size is verified and documented after the work has cooled down and before it leaves the area. If there are any questions or issues with the spray, they are addressed before passing the job on. There is no doubt when the part leaves the area that the coating has been correctly applied and that the documentation supports this fact.

Highly effective spray operators have highly effective management skills and have had extensive training. They tend to work under a highly effective management team, since many of the specifics outlined above can only come from the management of the thermal spray job shop.

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New channel-partners for vaBW

African Fusion talks to Herbert Abbott, Regional Sales Officer for voestalpine Böhler Welding Middle East and Africa, about the company's recently adopted channel partner approach for South Africa and the Sub-Sahara sub-region, and what this means for local customers.

Renewing the company's commitment to service the welding needs of South Africa and sub-Saharan Africa, voestalpine Böhler Welding (vaBW) is expanding its distribution network for its Böhler Welding, UTP and Fontagen product portfolios.

"voestalpine Bohler Welding is a global company under the umbrella of voestalpine AG, a global organisation that employs approximately 52 000 employees worldwide," begins Herbert Abbott.

"vaBW is well known and respected in the South African market for its trusted range of premium quality welding filler metal brands i.e. Bohler Welding, UTP and Fontagen – fully supported by the company' highly regarded welding metallurgy and welding applications know-how. Our products have been approved and confidently used in the most demanding ap-

plications across industries such as Power Generation, Oil & Gas, Construction, Chemical, Transportation, Cement,

Mining and Sugar to name a few. In recent years vaBW has expanded its offering to include, for example, premium quality ranges of welding equipment, automation, and a high-end PPE and accessories, all with the intention of assisting our customers to achieve the perfect weld seam.

"For decades, selected products from our comprehensive portfolio were available to the South African market via two successive exclusive channel partners. As from 1st January 2024, vaBW has adopt a non-exclusive channel partner approach and is actively seeking and recruiting additional quality strategic distribution partners to take our comprehensive world class product portfolio to the market," Abbott tells *African Fusion*.

"To bolster our sales, service and distribution network and to make it easier for customers to access our full range of products and, furthermore, to benefit from the resultant higher levels of customer service and support, we believe strongly in adding strategic distribution partners in the region, each with their own unique expertise and strengths," says Abbott. "We are excited by this latest evolution of our business and are confident it will enhance the value proposition to existing and future customers," he adds.

"Since the adoption of the new channel approach at the beginning of 2024, we are very pleased to announce that we have signed a distributor agreement with Renttech SA, who has a well-established footprint across South Africa – including branches in Gauteng, Western Cape, Eastern Cape, KwaZulu-Natal, Mpumalanga, North West, Limpopo, Free State, and the Northern Cape – and will be a national channel partner for our diverse range of Bohler Welding, UTP and Fontagen filler metals on a non-exclusive basis. Renttech has already demonstrated its commitment via a significant investment in a broad range of inventory products. Stock will be arriving from our global manufacturing facilities within the coming weeks and, considering the range they have included in their pilot order, I believe they will hit the ground running to cater for a large



percentage of the day-to-day welding requirements of their clients in the industry segments where they have proven to be very strong over the years. Since many of our filler metal products are already qualified for use by the major South African fabricators, there should be little to no difficulties in reintroducing our products to those valued customers," Abbott informs *African Fusion*.

"In addition, in the Western Cape, we are proud to announce that we have signed a distributor agreement with RSA Welding who is a very well-established welding product distributor focusing on the Western Cape market and who has earned a reputation in the market for service excellence and loyalty. RSA Welding will stock, promote and support vaBW's comprehensive range of products including Bohler Welding, UTP and Fontagen filler metals, our welding equipment range and our range of PPE and accessories.

"The company has already demonstrated its commitment by making an investment in a range of filler metals and welding equipment for inventory," Herbert Abbott assures.

"We are in discussions with a number of additional potential distribution partners who are located in the major industrial hubs around South Africa, all of whom we have identified as being able to enhance our presence and access to our world-class products," says Abbott.

When asked how vaBW would manage potential channel conflict between multiple distributor partners in a common market he says that vaBW has in excess of 4 000 active distribution partners globally and that it is very common for the company to have multiple non-exclusive distributor partners in a single country or region and that those distributor partners are able to coexist and flourish because of the ethical



The Böhler TERRA NX 400 PME is a next-generation welding machine that enhances productivity and is user-friendly and ideal for heavy-duty applications in the metal fabrication industry.



Approval certificates with the new diamondspark names are available for ABS, BV, LR, RINA, TÜV and DB.



In combination with diamondspark flux cored wires, pipeRunner® can produce excellent girth welds of the highest quality, minimising NDT indications and lowering repair rates.

and fair manner in which vaBW supports all distributor partners.

“We arm our committed distributor partners with the necessary industry, application and product knowledge and then assist them to hone and leverage their unique strengths and experience in order to sell and support our products. When we get this right, the customers – who have the right to choose from whom they wish to purchase our products – will choose the partner they believe adds the most value to their operation,” he assures.

Experience the perfect weld seam

The high-quality range of vaBW filler metals, equipment, automation PPE and accessories being made available to selected distribution partners in South Africa will be showcased via a series of road shows which will kick off in June 2024. “We intend to feature, for example, the unique MIG/MAG process technology under the hood of the newly launched state-of-the-art TERRA NX PME series of pulsed MIG/MAG welding machines. These technologies include RapiDeep and QuickPulse2, which have both been developed by voestalpine Bohler Welding to improve productivity and weld seam quality,” he continues.

RapiDeep is an innovation designed to deliver a highly concentrated arc for consistency, lower heat input, higher arc



A distributor demonstration of railRunner, which is able to perform in any welding position and, with vaBW consumables, takes productivity to another level.

precision, easier control, deeper penetration as well as reduced undercut risks. “RapiDeep allows the welding speed to be significantly increased, with a direct impact on welding costs through higher deposition rates and productivity and reduced welding time. The end result is better penetration, cleaner and smoother weld seams, and increased welding speeds of up to 60%,” Abbott explains.

QuickPulse2 is a pulsed MIG/MAG process that offers the same benefits as RapiDeep with the added advantage of the synergic pulsed mode, which can deliver further heat input reductions, an increase in welding speeds, along with similar high precision and deep penetration advantages.

“Our new Cape Town based distributor – RSA Welding recently took us to a local manufacturer where we had the opportunity to demonstrate these unique processes. We successfully demonstrated QuickPulse2 on the new Böehler TERRA NX 400 PME welding set in combination with our diamondspark seamless metal-cored wire whilst running our tailored Bohler Arc synergic lines for the selected Bohler metal-cored wire on a number of different weld joint configurations and in various weld positions. The weld quality and deposition rate were simply mind blowing! Because of the very stable wire feed rate, the consistency of the arc length and exceptionally accurate arc positioning, the customer’s welders were able to comfortably push the wire feed rate far beyond what they were conventionally used to and, as a result, they were welding at speeds they had never experienced before.

We look forward to presenting this tech-

nology to a broader audience during our road show events and also via personalised demo days at customers in South Africa very soon,” Abbott relates.

vaBW also intends to unveil a selected range of market relevant mechanised welding solutions during their roadshow events in South Africa. Among these solutions is the family of mechanised welding carriages – wheelRunner, railRunner and pipeRunner.

“One of our mechanised solutions, with which we have had terrific success in our region, is our pipeRunner orbital MIG/MAG welding system for automated welding of pipe girth seams. We are able to weld 8-inch diameter pipe and upward with this solution and we have a wide range of tried and tested seamless and conventional cored wires to weld a broad variety of material grades. For many of these, we already have trial procedures available, which can very swiftly get our customers up and running.

As a key to success, we do not only sell the mechanised welding carriage and power source, but an entire solution consisting of the equipment, the welding filler metals, the procedure development and qualification, welder training and qualification and, at customer request, even onsite technical support for ongoing production,” adds Abbott.

“We look forward to engaging our valued customers and distributor partners during our forthcoming road show events and are excited about the additional benefits our new distributors will bring to local customers who choose voestalpine Bohler Welding. Please come to experience the perfect weld seam for yourselves,” Herbert Abbott concludes.

welding.middle-east@voestalpine.com

Collaboration re-imagined: Renttech SA partners with voestalpine Böhler Welding

After much anticipation, Renttech South Africa has become a national distribution partner for the voestalpine Böhler Welding range of welding consumables. *African Fusion* talks to Renttech MD, Duncan Whitehead.

Over the past six years Renttech South Africa, a subsidiary of Bidvest Group of Companies, has been building its business into a leading provider of quality welding solutions for the Southern Africa welding market. “Part of that process was to raise the bar with respect to the welding power sources we sell, which is why we have taken on the Kemppi equipment range. But we also needed to marry our welding equipment with world-renowned quality consumable products – and the voestalpine Böhler Welding (vaBW) range is a perfect fit,” begins Duncan Whitehead, managing director at Renttech.

“We have long been on the lookout for a consumable range that meets the high-end needs of the petrochemical, power generation, OEM equipment fabrication and marine sectors, demanding the best in terms of quality, certification and approvals. We are therefore very excited and proud to announce that we have been appointed as a national distributor for the vaBW range

of products,” Whitehead tells *African Fusion*.

Renttech has decided to carry a comprehensive range suited to the South African market, from stick/MMAW and TIG/GTAW welding consumables to solid, metal-cored and flux-cored wires for GMAW/MCAW/FCAW, and fluxes and wires for submerged arc welding. “As the market grows, we intend to start offering some of the more specialised consumables, as required by the various sectors,” he says.

The vaBW brand has been in South Africa for decades and throughout that time it has been the welding consumable of choice for demanding welding environments. In certain markets, the products are considered superior to any competing brands when it comes to quality, value and performance. In addition, from a weldability point of view, many welders prefer these consumables, Whitehead explains.

“We have now found a reputable consumable range to make our own and we are rolling it out into the South African market, along with our equipment and safety



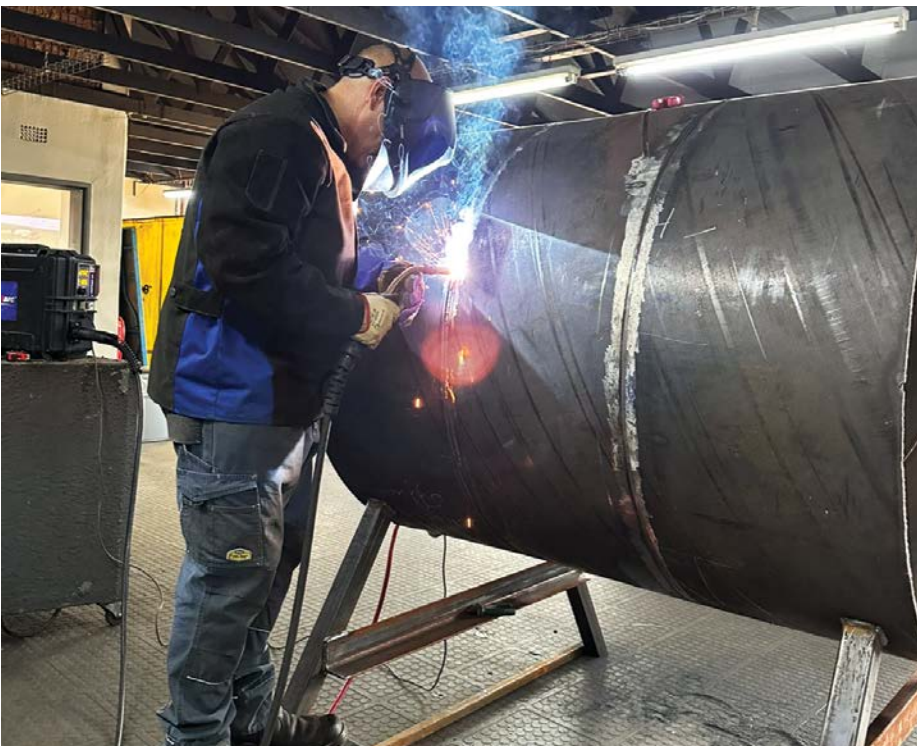
offerings, to better support the different segments including petrochemical, power and fabrication industries,” he says, adding that, as with all Renttech products, technical support and country-wide stock availability will be key features of the offering.

Packaged welding solutions

Most customers already have a fleet of welding equipment, so we are exploring the advantages of using selected Böhler Welding consumables to raise performance levels and productivity. At some sites, though, we are coupling these consumables with our own UNIARC and Kemppi high-end equipment brands to develop packaged welding solutions. For example, we have seen some excellent results from combining Kemppi power sources with the high-end Böhler Welding ‘diamondspark’ and ‘ECOspark’ welding wires, resulting in reduced fettling and in the number of welding passes to complete certain weld joints” says Whitehead.

While there will always be a place for stick welding, advanced process equipment and better consumables have significantly improved the wire-based processes, which are now easier and faster to use while being far less susceptible to welding defects. This is particularly evident when a good, packaged solution is put together that includes a combination of an appropriate consumable with well-matched welding equipment, and accurate prepping equipment to reduce fit-up problems.

“Customarily, for example, pulse machines were achieving slightly slower welding speeds than traditional CV welding, resulting in customers preferring the CV



Renttech is coupling voestalpine Böhler welding consumables with its own UNIARC and Kemppi high-end equipment brands to develop packaged welding solutions.



An application trial being done at Renttech's Alrode premises. The root weld is being done using the Böhler Ecospark 420 (ER70S-6) solid wire and the Wiseroot function on a Kemppi welding machine. The fill and cap was then done using the Bohler Diamondspark 46RC (E71T-1M) flux-cored wire using a Promotech Rail Titan welding and cutting tractor.

MIG process despite the benefits of pulse welding. Now, with the advanced pulse technology available in the Kemppi range, we can get 30 to 40% higher deposition rates – or travel speeds, depending on which you are after – using standard GMAW wire (ER70S-6). If we go one step further using the Böhler Welding metal cored wire, a further 20% improvement becomes available,” he says, adding, “this becomes very interesting for customers chasing productivity improvements.

“The welding market is a complex one, with each sector having its own unique requirements in terms of quality consumables and welding equipment. voestalpine Böhler Welding offers a complete consumable portfolio to service these different markets from ‘run of the mill’ mild steel consumables to specialised alloys and hard facing consumables across the various welding processes. They are also able to cater for a full range of metallurgical testing requirements as required by some of the more niche sectors. As Renttech has customers across these sectors it made sense to partner with one of the best consumable brands globally to be able to offer the full welding solution,” he explains.

On the submerged arc side, Renttech is able to deliver a packaged solution using its UNIARC ASAW1250II – a 1 250 A machine with a 100% duty-cycle at 40 °C – with flux and wire combinations ranging from mild steel to the low- and high-alloys, hard facing as well as nickel alloys, all with the idea of chasing higher productivity, enhanced



voestalpine Böhler Welding offers a complete consumable portfolio to service these different markets from ‘run of the mill’ mild steel consumables to specialised alloys and hard facing consumables across the various welding processes.

deposition rates, fewer weld passes, less heat input for less distortion and reduced post weld operations.

The Böhler Welding range also offers a full array of stick electrodes favoured by welders and quality personnel alike for its numerous applications across the major industry segments found in Southern Africa.

“The fact is, vaBW has been manufacturing quality welding consumables since 1926. With almost 100 years of experience, the company has an extensive R&D skill set, metallurgical and applications know-how, technical and managerial expertise, and experience across all its businesses, as well as state-of-the-art manufacturing facilities across the globe. The company is passionate about welding making it a perfect fit for us. Customers also know this based on the quality and performance that welders get from using Böhler Welding consumables,” Whitehead says.

To meet the unique needs of the South African market, he says Renttech needed to address several key issues, in combination: quality, affordability, productivity and the skills of labour in South Africa. “We have had to find the right products that are easy to use, yet still deliver successful results to business owners, product users, and quality personnel. Böhler Welding was a key component in making this happen. We have always trusted and had a high regard for the quality of Böhler Welding consumables, even as a competitor, as our South African petrochemical, power and fabrication customers have for over 40 years. There is excellent brand recognition and we have now made sure that the supply chain is in place to get the brand back onto shop floors.

“Also, we are on a drive to help South

African industry to be competitive in the international space because, whether we like it or not, we are competing with the rest of the world for the work that needs to be done here in South Africa. We want to put local fabricators in the best possible position to be able to compete and to keep the work in country, whether through automation, better equipment, higher quality consumables, or carefully structured solutions that combine all of these. This meant that we had to tailor our offering to include the best product ranges, at the best possible prices, whilst striving for the best service levels to ensure our customers have confidence in our ability to move forward with them. Böhler Welding consumables will play a key part in this journey as we continue to build Renttech into a leading welding supplier in Southern Africa.

“It is important also to acknowledge the support of our shareholder, Bidvest, without whom this whole journey would have been a lot more difficult. We have enjoyed a wide spectrum of support along the way. For instance, we have been using Bidvest International Logistics as our external freight forwarders to manage our logistics and imports from different countries around the globe for a number of years now. This partnership between two sister Bidvest companies works very well for us and our customers, making more stock available more frequently and on time,” says Duncan Whitehead.

“We now believe that, with the addition of the Böhler Welding consumable range to our portfolio of products and services, we are well positioned for sustainable growth and continued support to the Southern African welding community,” he concludes.

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Starweld answers the call

Steve Hutchinson of Starweld outlines the history of the locally designed and manufactured Starweld brand of micro-processor driven inverter-based welding machines, which have gained a reputation for meeting the performance and reliability requirements of local fabricators. Most notably, they have recently won favour with the South African Railway industry.

Drawing on experience gained in the late 1990s and early 2000s, Starweld has steadily grown from a small two-man, start-up operation, that began in 2011 into a company that supplies welding equipment into a variety of key welding market segments.

“Starweld’s microprocessor driven technology, combined with robust, 100% duty-cycle designs, provides the welding market with a wide range of locally manufactured welding machine options that deliver optimal performance in our arduous African conditions,” begins Steve Hutchinson.

The stainless steel industry

Starweld began its local welding machine manufacturing with the advent of a dedicated dc high-frequency start TIG welding inverter, which offered a built-in pulsed-TIG menu for the South African Stainless Steel Welding Industry. The initial order came from DB Thermal, the renowned provider of component solutions to the South African power, oil and gas industries. Manufacturing of these Starweld power sources took place in a small 200 m² mini factory in Boksburg.

The resulting Starweld multi-process



The Starweld digitally controlled Deca Feeder Series, was also introduced for use where precise welding parameters needed to be recorded.



The Starweld CC/CV Quatro power sources delivered to Transnet. These machines are tunnel cooled to prevent contaminated cooling air passing over electrical and other components in the machine.

water cooled AlphaTig 450 amp welder has a high duty cycle. The Starweld Aqua Cooler attaches to the base of any of the Starweld CC/CV machines in the range, creating a single unit that is then mounted onto an undercarriage. The added advantage is that the cooler is powered off the welding machine power source, instead of having to be externally powered from a 220 V auxiliary supply.

The inclusion of an in-line water flow transducer is an industry first for precise electronic monitoring of water flow. The microprocessor in the Aqua Cooler then communicates, via the digital display on the power source, any warnings regarding interruptions to water flow.

The underground mining industry

Soon after, Starweld developed the ergonomically designed Icon Series of 200, 300 and 400 A dc MMA/stick welding machines for the underground mining industry.

The requirement was for the machines to have a 380 and 525 V input voltage selector switch. This could, however, have been dangerously problematic if the machine was switched to 380 V when plugged into a 525 V supply. It was at this point that Starweld developed a unique AUTO SELECT option, which enables the machine to automatically accept either a 380 or 525 V input supply without the need for a selector switch.

All Starweld machines have a closed-



loop current monitoring feature that ensures the output current settings are maintained by continually monitoring the input power supply and automatically adjusting the output current to compensate for mains fluctuations. “Mining companies in Southern Africa insist that all welding machines that are brought onsite be fitted with a voltage reduction (VDR) system, a low open circuit voltage safety device that removes the risks of electric shock when operators are welding in moist conditions. These devices are often external devices that are retrofitted to the machine. Unfortunately, they can be tampered with and disconnected,” explains Hutchinson.

“All Starweld machines have a built-in, fail-safe, tamper-proof, electronically controlled, VOLT LOC voltage reduction safety system that is installed at no additional cost. The system’s activation is confirmed by the letters ‘LOC’ flashing on the digital display before and after welding.

The yellow metal industry

Requests were then made for Starweld to develop machines for the Earth Moving sector/yellow metal industry. This market involves manufacturing and repair of excavator buckets, dump trucks bins, undercarriages and tracks used in earth moving and open cast mining machines. The requirement was for heavy duty MIG welding, arc air gouging and submerged arc welding machines.

Two large international welding machine manufacturers had historically controlled the supply of equipment into this market segment, but due to the weakening Rand against the Dollar, prices had escalat-

ed significantly. Due to the excessive cost, spare parts were only being imported when clients ordered them. This meant lengthy time delays, and extended down-times for the customers waiting for their machines to be returned to service.

A larger South African mining equipment hire company, Sandton Plant, was among the first companies to test the Starweld Orion 600 MIG and gouging machine in its Midrand workshops. Apart from the affordable purchase price of the Orion 600, Sandton Plant discovered significant electricity usage savings compared to the more-expensive imported transformer-based welding machines. Spare parts were also readily available, at greatly reduced prices. Sandton Plant recently ordered its sixteenth Orion 600 welding package.

Success at Transnet

In 2023, Starweld met with Craig Ruthnam. Through his company, Amber Skies in KwaZulu-Natal, Ruthnam has built up extensive experience in dealing with the South African Rail Industry. This made him the ideal partner to introduce Starweld products into Transnet facilities across South Africa.

Early in July 2023, a variety of welding trials were carried out, in various workshops, at Transnet’s Bayhead facility in Durban. These trials were initially begun using the Starweld Quatro MIG welding machines.

Craig Ruthnam points out that, as with all Starweld CC/CV machines, the Quatro power source is tunnel cooled, protecting critical electronic components from becoming damaged from contaminated cooling air. A further advantage of the Starweld CC/CV machines is that they have no mechanical electrical contactors and selector switches. This eliminates issues associated with parts that wear out over time. The problem is accelerated in machines where contaminated cooling air passes over electrical and other components in the machine.

The Transnet trials then extended to the Starweld AlfaTig range. These machines have all the features of the Quatro range, with the added advantages of a high frequency (HF) start function, and a built-in Pulsed TIG welding option, similar to the machine developed for DB Thermal in 2011.

The Starweld digitally controlled Deca Feeder Series was also introduced for use where precise welding parameters needed to be recorded. Wire speed and amperage is digitally set, and wire usage per metre is recorded. Pre- and post gas flow are



The Starweld 1 000 A INFINITY submerged arc welder developed for the yellow metal industry.

manually controlled on the front panel of the feeder and the standard 4-wheel drive feeder has gas flow parameters pre-set on the PC board.

A variety of Starweld MIG welding guns were also tested, including both 5 m air and water cooled guns. The Starweld 10 m push/pull torch was supplied to welders operating inside the rail cars, where the welders required greater freedom of movement. An added benefit is the wire speed, which can be controlled from the gun handle,” Hutchinson tells African Fusion.

The trials proved to be extremely successful and on 26th July 2023 the first Starweld welding machines were delivered to the Bayhead workshops. By the end of October 2023, a total of 83 Starweld machines were operating in various workshops throughout the Durban facility.

Being passionately loyal South Africans, Hutchinson and business partner Robert Case, believe that the most satisfying aspect of the growth of the Starweld brand is that South Africans are once again placing their belief in home-grown South African technologies.

“Not only are Starweld welding machines competing favourably with welding machines manufactured across the world, but employment and growth opportunities are being created for previously disadvantaged South Africans,” he says.

“Ubuntu! I am because we are!” Hutchinson concludes.

www.starweld.co.za

Learning to weld the easy way

Fronius has launched its new Welducation Simulator to better enable welders to learn, train and consolidate their welding skills using augmented reality under realistic conditions. Edric van der Walt of Fronius South Africa outlines the advantages.

Using the newly available Welducation Simulator, welders can learn, train, and consolidate their welding skills step-by-step under realistic conditions without any risk to safety and with no additional costs for materials, gases or wear parts. "The new augmented reality glasses make the weld, the welding process and hence the entire welding experience astonishingly realistic, while the Welducation Campus rounds off the entire training package by teaching the theoretical aspects of welding," says Edric van der Walt of Fronius South Africa.

The saying 'a trade in hand finds gold in every land', has by no means lost its relevance in the present day. But when it comes to highly qualified welders, the shortage of skilled workers is an ever-present issue. "Excellent welder training and the high degree of user friendliness of all our welding solutions are two ways in which Fronius is addressing this challenge," he says.

Virtual training with the new Welducation Simulator is the perfect instrument to simulate complex processes and tricky situations in a risk-free and cost-effective way, and to repeat them time and again without wasting resources. Thanks to these exercises, beginners can improve their

welding skills in a safe environment and learn directly from their mistakes, perfectly preparing them for welding on a real seam.

High-tech training for the challenges of tomorrow

With its latest welding simulator, Fronius is not only focusing on virtual reality or VR, but also on augmented reality (AR). Another concept mentioned in this context is extended reality. This technique is characterised by the insertion of digital elements into the real world – be it on a screen or on a pair of glasses – directly in front of the viewer's eyes. Employing AR technology and using original welding torches, hosepacks and the housing of a real Fronius welding system create a genuine welding experience.

Trainees can use the Welducation Simulator to practice three processes: manual metal arc welding (MMAW), gas-metal arc welding (GMAW/MIG/MAG) and gas-tungsten arc welding (GTAW/TIG). They do this while using various materials (steel, stainless steel and aluminium), material thicknesses, and welding positions in the welding simulation.

Common practice workpieces and adjustable welding parameters complete the realistic conditions because the training is



not only about achieving the perfect weld: as with a welding challenge in the real world, it is also necessary to complete tasks before, between and after joining. This includes such activities as installing the return lead cable, setting the correct welding parameters and replacing the electrode. The tablet with the simulator also shows the standard interface of a Fronius welding system so that participants can become familiar with using real welding systems.

Safe, sustainable, and efficient

Welding is one of mankind's oldest joining processes and it is hard to think of life without it in workshops and industry. However, the arc, UV radiation and welding fumes all raise safety issues. It is essential to protect all welders against these dangers as best we can. Risk minimisation is becoming increasingly important during training, and the best way to ensure safety is to eliminate all risks. The Welducation Simulator offers a protected virtual environment in which trainee welders are not exposed to any risks or pollutants. This means they can have fun learning to weld before creating their first welds in the real world.

What is more, virtual welder training is significantly more efficient and resource-conserving than conventional training. Expensive consumables, such as metal, wire and shielding gas, are not required, and the bulk of the component training can be done on the simulator. The arc time achieved by trainee welders is as much as 65% higher.

As the workflow between welds on the simulator is very simple, up to three times as many welding tests can be carried out on the simulator in the same amount of time they would take in the welding booth, saving resources, costs and time.

Practice makes perfect

Each welding task requires different techniques and manual skills. The stand sup-



Theory and practice are combined: the didactic concept enables trainee welders to deepen their knowledge while developing their practical skills at the same time.



Providing an “astonishingly realistic” experience is an augmented reality headset, which enables welding challenges to be created in a simulated real-life environment.

plied with Fronius’ Welducation Simulator offers a variety of options for attaching various workpieces in different positions. An additional large stand is available to provide even more variation. Whether an overhead fillet weld or a single-V butt weld, participants can practice nearly any welding position.

Virtual training offers three difficulty levels: easy, medium and difficult. For example, beginners with no prior knowledge receive plenty of assistance, while experienced users have to form their welds without any visual feedback on distance, angle of the welding torch or speed. In addition, wide-ranging analyses help trainees improve their technique and identify mistakes. All welds can be recorded and recalled at any time.



Augmented reality (AR), original welding torches and the housing of a real welding system create a stunningly realistic welding experience.

Theoretical content from the Welducation Campus

With its integrated Welducation Campus platform, the new Fronius simulator provides a complete teaching concept comprising theory and practical training units. Trainee welders can also acquire knowledge and skills on their own with the help of courses, rather than requiring continual guidance from instructors.

The training tool manages the results and learning progress itself, but there is also room for personalised learning, as instructors can make their own theoretical material available in the Campus if they wish. By spurring one another on and being assessed professionally, trainee welders learn quickly and effectively. The sophisticated assessment system delivers an objective and verifiable re-

sult, while the ranking of their own welding performance encourages trainee welders to realize their full potential.

At the SCHWISSEN & SCHNEIDEN 2023 trade fair, Fronius sent a strong signal regarding the shortage of skilled workers by donating a Welducation Simulator to two welding training institutes: Caritas in Austria and the BerufBildungsWerk Greifswald in Germany.

Locally, the Welducation Simulator will be available from Fronius Sales Partners: PROAC Engineering in the Eastern Cape Province, and Bolt and Engineering Distributors (B.E.D.) across the rest of South Africa.

www.fronius.com/en-za/south-africa

The multipurpose configuration supports various welding positions, materials and material thicknesses and the package includes standard workpieces and a stand.



Optimising shielding gas choices for GMAW and GTAW

Welding Specialist for Air Products in South Africa, Sean Young talks about shielding gas selection for optimised gas metal arc and gas tungsten arc welding (GMAW and GTAW), and the importance of understanding the role of each gas in the mix.

“Whether for manual or robotic welding, I have found that many welding gas customers do not understand how to match a shielding gas mixture to a GMAW or GTAW application to achieve the best results possible. They tend, instead, to stick to the same gas they first chose, the one they have always used and their distributor has always supplied. What they don't realise is that the best choice for welding quality and productivity depends on the specific application, most importantly, the material being welded; the material thickness; and the welding process being used.

“There is always a specific gas mixture

that will give the best result: better fusion, less spatter, better productivity and best possible welding stability,” begins Welding Specialist, Sean Young. “The selection of the specific gas mixture should be seen as an integral part optimising every welding procedure,” he says.

So how do we optimise the shielding gas choice? “I tend to get a good idea of what shielding gas will work by asking the customer three key questions: the process, the material being welded and the material thickness,” says Young.

If the process is GTAW, he continues, pure argon is the obvious shielding gas choice. “But is pure argon the best choice

for all materials? For thin sheet and root welding of carbon and stainless steels, we would say yes, but what about copper and aluminium, which are excellent heat conductors that dissipate the heat of the arc very quickly? A significantly increased amount of heat is required and even on relatively thin section material, an argon helium gas mixture or even pure helium may provide far better results,” Young tells *African Fusion*.

Moving onto the semi-automatic GMAW welding process, he says argon gas remains the gas of choice for welding aluminium and copper and their alloys. “Again, though, helium in the gas mix is often advantageous, particularly when welding thicker section materials,” he notes.

For GMAW welding of steels, however, the gas choice becomes much wider, depending on the process variant – CV or pulsed – and is highly dependent on the material thickness.

“Mixtures of carbon dioxide and oxygen in argon are usually the obvious choices, but there are many and it is important to understand the role that CO₂ and O₂ play in the various mixtures,” he says.

In the GMAW welding arc, he explains, carbon dioxide disassociates into ions of carbon monoxide and oxygen in a reaction that releases heat. In the weld pool, this additional heat results in increased plate melting and deeper penetration, which can also result in faster welding speeds and better productivity.

“But on the negative side, raising CO₂ levels leads to poorer arc stability, making it more difficult for the welder to manipulate and control the weld pool, which can result in incidences of lack of penetration and lack of sidewall fusion. Also, high CO₂ levels in shielding gases are associated with spatter,” he says.

“For welding stainless steels, CO₂ levels in the shielding gas should be limited to a maximum of 2% to prevent lamellar tearing; the carbon in the gas results in low ductility surface inclusions along the solidification front, which tear open on solidification due to internal stress,” Young points out.

On the role of oxygen, he says small percentages of O₂ in a shielding gas mixture decrease the surface tension. “This accelerates the pinch effect, making droplet sizes



It is important to match a shielding gas mixture to a GMAW or GTAW application to achieve the best results possible, says Sean Young.



smaller. It also results in a more fluid and flatter weld puddle,” he continues.

Smaller droplets also lead to smaller spatter particles being expelled from the weld pool, which often means they solidify in the air so they can simply be swept off the plate. This reduces the amount of post-weld grinding needed.

Carbon steel materials and plate thickness

Carbon steels are the most common materials welded with the GMAW process, and it is here that Young says there are the most opportunities for optimising the shielding gas choice. “Broadly speaking, you want a good compromise between weld stability, weld quality, penetration and speed,” he says.

For GMAW welding of thin section carbon steel plate in the 1.0 to 3.0 mm range, Young recommends a gas with a small percentage of O₂ and low levels of CO₂. “Coogar Plus is ideal. No additional heat is needed to penetrate the thin material and care needs to be taken not to burn through. This also applies to welding thin material onto thicker material. When a 3 mm section is being welded into a 20 mm section, a properly fused weld of 3 mm is required, there is no need to choose the gas to suit the thicker section material,” Young advises.

Magmix 3 delivers excellent arc stability, optimised metal transfer characteristics and good surface profiles for thinner materials. “It also offers a wider tolerance envelope with respect to the welding current, voltage and wire feed parameters, which means welders do not have to be 100% spot on with the machine set-up,” he adds.

For slightly thicker section carbon steel in the 3 to 8 mm range, Sean Young recommends the Magmix 3 shielding gas mixture, which has a little more CO₂ to deliver deeper penetration.

“For high speed down hand position welding of steels in the 9 to 15 mm range, we suggest Coogar 89, which is a mix that offers higher fluidity and heat. This, of course, makes the mix unsuitable for positional welding,” he advises.

Air Products’ Coogar 84, he says, has been developed for 12 to 20 mm carbon steel material, and Coogar 82 is recommended for a thick section plate of 20 mm and above. This mix does not contain oxygen because higher welding currents will typically be used, therefore increased fluidity is not needed.

“For robotic welding, particularly when using synergic or pulsed modes, we also



Left: An argon 18% CO₂ GMAW weld shows significant amounts of spatter, which increases weld cleaning time. Right: By changing the shielding gas to Magmix 3 with CO₂, much less spatter is produced, almost eliminating post weld cleaning requirements.

recommend a two-part mix of argon and CO₂ because, when pulsing, high stability is favoured over fluidity,” he says, adding that Air Products’ argon+CO₂ Ultra Blend as well as the Coogar 82 mix are ideal for most spatter-free and automated pulsed GMAW applications.

“Welding optimisation is about making it as easy as possible for the welder to achieve the quality results required in the fastest possible time with the minimum amount of post weld cleaning,” notes Young.

“When welders struggle with stability and unwanted spatter while welding, the grinder must be removed after welding to clean the plate and joint. We look at what our customers are welding to optimise their process and to prevent them from having to pick up a grinder after every weld.

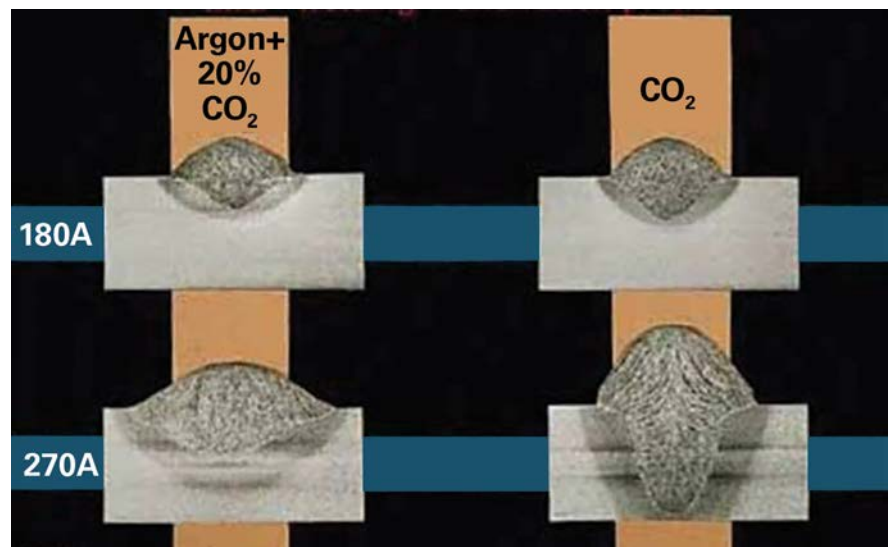
“By making shielding gas choices that are better matched with the specific mate-



A 20 second aluminium TIG/GTAW welding comparison on thicker section plate using accurate at 150 A. Left: 100% Ar; Right, Ar+He.

rial, selecting the correct material thickness and ensuring that the correct process is used, Air Products’ expertise can drastically assist in raising the weld quality and significantly raise productivity at the same time,” concludes Sean Young.

<https://airproducts.co.za>



A comparison of the penetration difference when GMAW is used with an argon 20% CO₂ mix and 100% CO₂.



Cosmo Group celebrates 30 years



Founded in 1994, this year Cosmo Group is celebrating 30 years of growth and service to Sub-Saharan Africa and South African industry. Group CEO, Pierre van Nieuwenhuizen reflects on the journey.

ally expanded their offerings, supplying a wider range of welding machines and consumables, gas, and safety equipment. They secured their first agencies: with Lincoln Electric for welding equipment and consumables, and with Air Products for industrial gases – and 30 years later, they remain loyal to these two chosen brands.

Over the years, the range of products and services that Cosmo Group offers its clients, has grown significantly. New people, products, brands and relationships have been onboarded and developed every year. Cosmo Group now includes several companies: Cosmo Industrial; Cosmo Automation; Cosmo Railway; Cosmo Manufacturing; Cosmo Mining; Cosmo Construction; Cosmo Training Academy; Silverton Tool Centre; and Silverton Cycles.

The Cosmo Superstore in Silverton has become a beacon for the Pretoria community serving as a platform for supplying products across South Africa. Additionally, the Cosmo online shop provides easy access to all its products.

“One of the first breakthroughs occurred when Cosmo Group started supplying Lincoln Electric welding equipment to Ford’s assembly facility in Watloo, Pretoria. This achievement was followed by securing a significant contract with Transnet’s railway manufacturing division ‘down the road’ in

Koedoespoort, Pretoria. These milestones, achieved in the first year of operation (1994), paved the way for Cosmo Gas and Welding Equipment, as we were known then. We celebrated these two successes. They really made us feel we were on our way,” Pierre van Nieuwenhuizen tells *African Fusion*.

“And while welding activity at Koedoespoort has died down in recent times”, he says that over the subsequent 25-years, following the initial sale, Cosmo continued to make an impact at the facility, installing over 500 Lincoln and SAF welding machines. “During much of our 30-year history, Transnet remained one of our primary customers, and for the first two decades, it was our largest” he notes.

“We have always believed in loyalty, first to our clients, but also to the brands we represent. We have remained loyal to Lincoln Electric as our premium brand, and this is underlined by the personal relationships I have built with key individuals at Lincoln Electric in South Africa,” he says. “Although Lincoln Electric’s management has shifted to Dubai, regular visits maintain the relationship so that it is in as bright place as ever,” he says.

On the gas front, Cosmo Group’s loyalty still extends to Air Products, a trusted partner for the 30-year journey. and is proud

Back in 1994, the paths of Rossouw van der Merwe and Pierre van Nieuwenhuizen’s first crossed, leading to the establishment of Cosmo Group in Silverton. “We were so young and incredibly enthusiastic back then,” recalls Pierre van Nieuwenhuizen. We had big dreams, and nothing could stop us. Our journey began by selling welding rods door-to-door – and we weren’t afraid to take on the biggest welding suppliers. Our vision was clear: start on our doorstep and expand until we ourselves, became the largest welding equipment supplier in sub-Saharan Africa.”

“The initial phase involved understanding customer needs and solving their problems. It was an exciting time that laid the foundation for what Cosmo Group has become today.” he adds.

From these humble beginnings, as a small two-person business, working from a house, these entrepreneurs gradu-



Air Products has partnered with the Cosmo Training Academy and is funding people out of rural areas on the IIW International Welder Diploma.



Cosmo's 30th Anniversary celebration will take place during the annual Cosmo Run; a local community event held every year in May.

that we are now the largest single-site Air Products gas supplier in South Africa.

"I think what we have done very well over the years is to diversify," he continues. "Recognising that welding industry needs extended beyond equipment, we expanded our range to include PPE and workwear; fasteners, abrasives, hand and power tools; lifting equipment, automation, and a host of industrial consumables and solutions, therefore setting out to supply a bigger basket of brands and products.

"We also quickly realised the need for training. We embarked on a journey to equip both our clients on how to best use the machines we were selling, but also, the upskilling of our workforce. Ten years ago, we established the Cosmo Training Academy. Today, the Academy proudly offers the IIW International Welder Diploma, and operates as an Authorised Training Body under the SAIW," he says.

This strategic move completes the circle in terms of supplying fabricators with everything they need. "On one hand, we provide them with top-quality equipment, consumables, gas, and tools. On the other hand, we empower them with skilled personnel who can effectively utilize these resources.

"But our commitment doesn't end there. We recognize the growing demand for on-the-job training directly at worksites. Therefore, we are in the process of adding the Procedure Qualification Record (PQR) to our offerings. Whether it's coding a welder, meeting code requirements, or assisting with welding procedures, we thrive on providing comprehensive solutions for our valued customers." van Nieuwenhuizen says.

"Cosmo Group also collaborates with many large companies are now helping to uplift the local communities. A good example is the partnership with Air Products, funding individuals from rural areas

studying the IIW International Welder Diploma. This partnership has been going for some time and the results are wonderful. Graduates have not only obtained new skills but have also established businesses within their communities. One such entrepreneur repairs wheel rims damaged by potholes—an achievement that fills us with pride."

The Cosmo Training Academy is currently training its third group of Air Products sponsored students, with half of the candidates being women. "Witnessing their development over eight to twelve weeks, it is a success story you can never forget," van Nieuwenhuizen points out.

Moving on to this year's big diversification initiative, he says that Cosmo Group has completed the construction of their warehouse and is currently launching a new house brand called Metal Force. "While we have been distributors and business partners of various brands in our store. Metal Force represents a strategic shift toward becoming importers and wholesalers. Cosmo Group will be a customer of this brand, but Metal Force will primarily be channelled through resellers to end-users," he says.

"Our initial focus lies on the solid MIG wire range for carbon steel, with plans to expand to stainless wire. Additionally, we're introducing gas welding and cutting equipment, including regulators, flowmeters, and torches. Excitingly, we've secured a comprehensive welding machine range covering MMA, MIG, pulsed MIG, TIG, laser welding, and cutting machines. The first machines are set to arrive in the coming weeks," he says.

"The journey to put the new Metal Force range together took us all over the world travelling searching for quality and reliable products," he says. "South Africa and the welding industry holds a lot of potential.



This year's big diversification initiative is the launch of Cosmo Group house brand, Metal Force.

We continually strive to improve, make informed choices, and add value for our customers."

"To all those young entrepreneurs in South Africa right now contemplating opening a business, I think now is a good time to start. There are a lot of opportunities in a country like South Africa. We need to rebuild in so many areas and we need fresh ideas and enthusiasm, so don't wait, start now!" advises Pierre van Nieuwenhuizen.

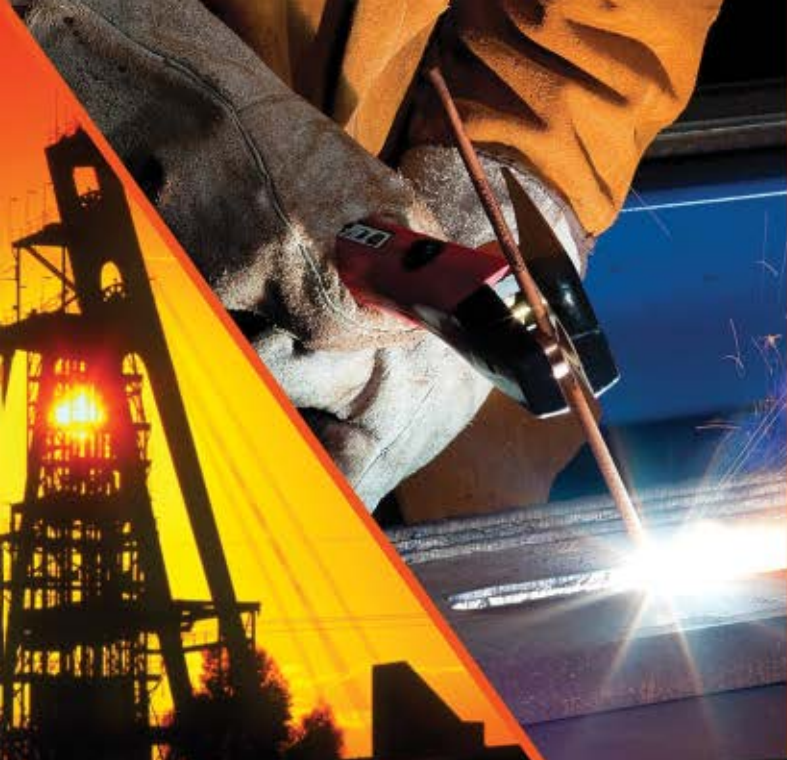
Cosmo Group's 30th Anniversary coincides with the annual Cosmo Run; a local community event held on the 25th of May. The Cosmo Run highlights the community-oriented mission that the Group has always pursued. "On 30 and 31 May, we are also hosting a 30th-anniversary celebration in-store at Silverton, welcoming our suppliers, customers, and the public.

"We extend heartfelt gratitude to all our customers for their unwavering support over the past three decades. Here's to many more years of growth, collaboration, and shared success," he concludes.

<https://cosmogroupsa.co.za>

QUATRO 500

**STAR
WELD**



ArcStrike introduces the Aquasol® range

Sean Blake, technical director of ArcStrike, talks about the new range of Aquasol® purging solutions and portable oxygen monitors being introduced into South Africa to help fabricators achieve clean and oxidation free root weld seams on the inside of pipes of all sizes.

“Traditional purge systems tend to be inefficient, costly and labour-intensive,” begins Sean Blake, technical director of ArcStrike. “To enable them to be removed, they must be placed several metres away from the weld zone, which results in large volumes of an inert purge gas being used to protect the narrow inner seams of weld joints. This adds unnecessary inconvenience and cost to the welding process,” he explains. In addition, not much science is applied which results in variable results.

To overcome these limitations, Aquasol® introduced water soluble paper and tape. Together, these components can be constructed by hand into unique purge dams. They can be conveniently placed close to the weld zone, which increases the efficiency of the welding process thereby reducing the volume of purge gas and reducing oxygen levels faster. And, water soluble paper provides an excellent gas barrier for retaining inert gases, such as argon and helium, within the weld zone during welding.

Made from sodium carboxyl methyl cellulose and wood pulp, Aquasol® Water Soluble Paper is 100% biodegradable and dissolves quickly and completely in most liquids – including water – leaving no residue behind in the pipeline. It is available in a wide range of grades and sizes for the construction of purge dams for any pipe diameter. It is easy to store, non-toxic and environmentally friendly.

“The Aquasol® system is ideal for any root welding of piping in steels, stainless steels, aluminium and any exotic material alloys in the nuclear, petrochemical and food and beverage industries,” says Blake. “In its basic form it comes in sheets of water-soluble paper that can be cut with a fold allowance to match the pipe diameter exactly, before being taped in place close to both sides of the pipe weld seam, to create an air-tight seal. Construction is simple, fast and customisable to fit various pipe schedules and sizes,” he notes.

“However, this basic form comes with the cut-to-size inconvenience, so Aquasol® has patented a more practical, EZ Purge®

range of pre-formed, self-adhesive purge dams to enable operators to save time on weld preparation and improve overall project efficiency,” Sean Blake continues.

EZ Purge® has tapered side walls to fit a variety of pipe schedules and its flat design enables equal distribution of gases across the body of the dam. “These purge dams come with EPA approved ZAP® – Zero Air Permeability – technology that maximises gas retention and reduces gas costs. They are also made of Aquasol’s water soluble material, though, so they can be washed out of the pipe after welding, leaving no contamination whatsoever, he says.

With EZ Purge®, the operator simply peels, inserts and presses the purge dam into place. “No other purge dam product on the market can provide such a reliable, efficient and environmentally sound solution to pipe purging needs,” Blake says.

Once a purge dam has been installed, and before welding, Blake recommends the outside of the joint first be covered with Aquasol® EZ Zone® welding tape, which can easily be peeled back as welding proceeds. The tape features a zone with no adhesive to prevent contamination of the weld joint. “First, though, the purge gas must be introduced using a purge needle connected to the inert gas supply, which needs to be able to displace the air, either from the underside or the top side, depending on the purge gas being used.

At this point, Blake advises, it is essential to monitor the oxygen level in the purge gas inside the pipe. “To fully protect a root weld seam from oxidation, the oxygen levels typically need to be reduced to below 100 ppm, as per the recommendations in AWS D18.1.

“I have used many oxygen analysers in my welding career, but the new Aquasol POM®-100B and POM®-5B offer a whole new level of performance and ease of use. They stabilise to an accurate reading far more quickly than previous models and the readings are precise.

“They come with built-in Bluetooth low energy capability (BLE), and a state-of-the-



“The new Aquasol POM®-100B and POM®-5B offer a whole new level of performance and ease of use,” says Blake.

art App enables the unit to communicate with any smart device, so you can check the reading from 30 m away. It also comes with a remote logging capability, so the records of the purging quality can be made available for reporting purposes,” Blake tells African Fusion.

Key features of Aquasol POMs include:

- Compatibility with any device with Bluetooth connectivity: Android, iOS and Windows phones, tablets, laptops, and PCs.
- Real time remote monitoring.
- Intelligent colour notification system of acceptable oxygen levels.
- A live chart view of the purge gas is presented, and the completed chart can be saved for simple reporting.

“All the raw data can also be saved, downloaded and stored, and each reading is date and time stamped,” adds Blake. “Aquasol POM monitors are capable of meeting the strictest quality control requirements of the most highly regulated industries in the world,” he assures.

“We already have a number of clients in the power sector and stainless steel-fabrication market interested in Aquasol products, and we are looking forward to these purging systems being adopted more widely to achieve the integrity needed on the inside of high integrity and food-safe pipe welds,” he concludes.

<https://arcstrike.co.za>

Why artificial intelligence matters in robotic technology

Andrew Crackett, managing director of Yaskawa Southern Africa, a pioneer in innovative automation and robotic welding, gives insight into the role of AI in robotic technology: its advantages and challenges and his predictions on what is to come.

The speed at which AI is being integrated into our rapidly advancing digital world makes it imperative for all industries to welcome its adoption, which is especially true for robotics. Crackett praises artificial intelligence as “the cognitive powerhouse behind the physical capabilities of robots, influencing everything from design and functionality to adaptability in diverse environments”.

AI provides robots with unmatched precision and efficiency, optimising actions through machine learning algorithms for enhanced productivity and accuracy. In addition, it improves safety standards as its integration enables robots to navigate complex environments, detect potential hazards, and execute tasks with a focus on minimising risks, which promotes human worker safety. AI also enables robots to make split-second decisions based on data analysis – a critical capability in dynamic environments such as manufacturing floors or autonomous vehicles that work along the production line.

However, it is equally critical to acknowledge AI’s potential shortcomings. As AI becomes standard in robotics, ethical concerns may arise which demand careful consideration and regulation regarding the use and accountability of AI-driven robots. Crackett explains: “Overcoming challenges and addressing any limitations in current AI models is essential for the continued advancement of AI-driven robotics.”

Harmonious collaboration between AI-driven robots and human workers is necessary, as the integration of robots – more specifically, collaborative robots (cobots) – needn’t mean the elimination of manual labour jobs. Cobots are designed to work alongside humans, taking on more labour-intensive tasks to free up capacity for upskilling and career development.

The future looks promising for AI and machine learning. Robots are capable of adapting,



Yaskawa Southern Africa is a pioneer in innovative automation and robotic welding.

learning, and performing increasingly complex tasks. “Synergy between humans and robots is key, with AI facilitating seamless collaboration, complementing human skills and augmenting workforce capabilities.

“But a focus on transparent and ethical AI practices is imperative for the future of AI in robotics to build trust and ensure responsible deployment across industries,” concludes Andrew Crackett.

www.yaskawa.za.com

SANAS Accreditation for NDT for INDTP

2 Roads Group company, Integrity NDT Projects (INDTP), a provider of conventional and advanced Non-Destructive Testing (NDT) services, has been awarded SANAS accreditation. This accreditation aligns all the company’s technical processes with the rigorous standards set by the South African National Accreditation System (SANAS).

This marks a milestone for INDTP and underscores the company’s unwavering

commitment to delivering top-tier NDT services characterised by reliability and excellence. The accreditation encompasses the broadest spectrum of SANAS-accredited NDT methods, standards and regulations in South Africa at this stage, positioning Integrity NDT as a leader in the industry.

“With SANAS Accreditation, we’re setting new standards, ensuring precision and excellence in every test. Our commitment to quality has never been stronger,” says

INDTP director, Thandy Mokgobu.

Integrity NDT Projects has emerged as the first SANAS-accredited NDT company in specific power generation national contracts, solidifying its position as a trusted and innovative partner in the power generation sector, amongst others.

Integrity NDT Projects’ dedication to excellence and transparency reflects its ongoing commitment to delivering advanced and conventional NDT services.

www.2roads.co.za



SuperSnake GTX – Ultimate access and distance solution for wire feeders

Kemppi has announced the launch of a new addition to the SuperSnake sub feeder product family: SuperSnake GTX. Extending the reach of standard Euro-connected MIG welding guns, the SuperSnake GTX guarantees reliable wire feeding up to 30 m from the primary wire feeding unit.

Compatible with the X5 FastMig family and standard Euro-connected MIG welding guns, Super Snake GTX provides a simple and effective distance wire-feeding solution.

Kemppi's SuperSnake easily reaches the welding sites not accessible with the standard welding equipment. Therefore, it is an excellent choice for large site environments, where equipment movement and reach present significant challenges, explains John Frost, Kemppi Product Manager Portable, Compact and System Class Equipment.

The SuperSnake GTX enables onsite challenges to be overcome, making the working conditions of the welders significantly safer because of special features and functions.

The SuperSnake GTX user interface places parameter adjustment at the welder's fingertips, including manual wire speed and voltage control, or automatic power regulation and fine-tuning. Automatic wire loading ensures trouble-free filler wire loading up to 30 m from that primary wire feeder.

The standard metal protection frame increases robustness and neatly combines, secures and supports the cables package and hoses. Easily opened for fast cable package management, the protection frame can also be used for suspending and hanging the SuperSnake GTX above the work area.

A safety lock switch also prevents welding with the primary welding system powered on. This is a valuable safety feature during rest breaks or moving between welding locations. Lighter in weight than standard wire feed units, SuperSnake GTX is easy to move and place on site which improves the worksite productivity and occupational safety, adds Frost.



Extending the reach of standard Euro-connected MIG welding guns, the SuperSnake GTX guarantees reliable wire feeding up to 30 m from the primary wire feeding unit.

Kemppi products are now available in South Africa from Renttech SA.

<https://renttechsa.co.za>

Lincoln ACECUT fibre laser cutting system introduced to SA

The Cosmo Group is introducing the state-of-the-art ACECUT 4020PRO series from Lincoln Electric into South Africa.

The 4020PRO is a fully protected and highly efficient CNC laser cutting machine with an enclosed case to prevent potential personnel injuries caused by laser scattering. Further enhancing safety is a built-in enhanced exhaust system, which is more environmentally and user-friendly, for fume.

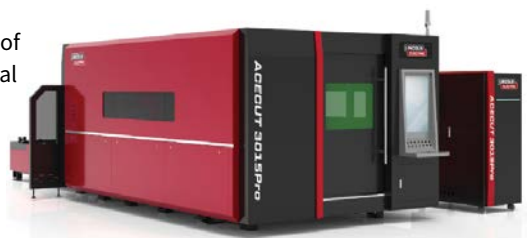
The exchangeable cutting table assists customers in loading materials during the cutting process to maximise production efficiency and facilitate a rapid return on investment. Some of the standard machine features for the CNC table include, high electro-optical conversion efficiency; high accuracy rack and pinion positioning; auto lubrication and ETHERCAT control.

A Raycus fibre laser with an intelligent cutting head is incorporated as the laser source for plate cutting. Raycus Laser is

a leading developer and manufacturer of high-performance fibre lasers for industrial and scientific applications. Founded in 2007 and headquartered in Wuhan, China, Raycus has quickly become a global leader in laser technology with a product portfolio that includes pulsed fibre lasers, continuous wave fibre lasers, and ultrafast lasers.

The company's state-of-the-art lasers are used in a wide range of industries, including automotive manufacturing, aerospace, electronics, and medical devices. With a focus on innovation and quality, Raycus is committed to delivering cutting-edge laser solutions that meet the needs of its customers around the world.

In order to ensure trouble-free long-term operation of the equipment, Lincoln Electric has incorporated multiple sensors for temperature, pressure and safety protection, amongst others. Only premium brand electrical components have been



The state-of-the-art ACECUT 4020PRO series from Lincoln Electric is now available in South Africa from Cosmo Group.

used to minimise the possibility of equipment downtime caused by malfunctions. In addition, the system comes with a global warranty.

"With years of mechanical design experience and accumulated industry solutions, Lincoln Electric is a trusted brand. The company continuously develops products that meet customer needs and does not lower product standards as a result of intense market competition," notes Petrus Pretorius of Cosmo Group.

www.cosmogroupsa.co.za

Cooperheat of Africa: Innovative purpose driven heat treatment solutions

Diresh Naicker, deputy GM of Cooperheat of Africa, talks about the innovative heat treatment services offered by the company and the purpose-driven solutions offered to clients with unique needs, most notably, induction heat treatment.

“We at Cooperheat have a full suite of heat treatment solutions available to us and a long history of applying these in unique ways to meet the needs of clients in industry,” begins Diresh Naicker, deputy GM at Cooperheat.

Core services include: electrical resistance heating, high velocity fuel heating, refractory dry-out and induction heating solutions,” he says. Cooperheat can construct and erect temporary heat treatment furnaces of any size, and it has an electric surface heating division dedicated to trace heating applications, where a product flowing in a pipe circuit needs to be maintained at a predefined viscosity to keep it fluid. “We install permanent trace heating elements across the whole circuit and then we monitor and control the temperature of the fluid to ensure flowability,” Diresh Naicker explains.

Turning attention back to the heat treatment offering, he says that Cooperheat can offer quenching and tempering, hardening and stress relieving heat treatment options for the welding and metal fabrication industries.

He says that stress relieving, especially for welded fabrications, can involve heating of material up to 760 °C, then holding at this temperature for a predetermined time. If using electric resistance heating, ceramic heating pads are placed around the pipe or nozzle or tank, and the temperature and

time requirement is programmed and then recorded. The same applies to high-velocity fuel heating, which can be heated by either an LPG or diesel flame forced into or onto the weldment using a blower.

“New refractory linings for furnaces and kilns, for example, must be carefully baked to prevent them from cracking. In principle, we simply create a large oven, heated by a burner with its temperature measured, controlled, and recorded,” Naicker tells African Fusion.

Describing the dry-out cycle for typical refractory lined furnace, he says that, from ambient the inside of the furnace is heated to 50 °C and held there for two hours. Then the temperature is ramped up to 150 °C for three hours, followed by 350 °C for 12 hours. Then the refractory is allowed to slowly cool back to ambient.

Induction heating: localised and fast

Unlike resistance and flame heating, induction heating can be easily localised to a small area of a fabrication, which makes the process ideal for heat treating welds. “Induction heating only works on magnetic materials, but this makes it ideal for the carbon steel welding work we do. The induction system generates a powerful magnetic field in a flexible coil, which is coiled over the area being treated. This creates eddy currents in the steel immediately under the coil which ultimately makes the material within the coil the heating element,” explains Diresh Naicker.

“We have had some amazing successes with this process. The heat is so focused, and the brilliant part is, the coils don't heat up at all. The heat goes directly into the steel plate or pipe,” he says.

Naicker goes on to show a video of just how fast the induction heating can raise the temperature of a steel pipe. Starting from 32°C, within 15 seconds the temperature underneath the pipe had risen to 150°; and it reached the target 300 °C temperature within 45 seconds. “This was a 4-inch/60 mm pipe with an 8.56 mm wall thickness, and we get it to heat treatment control temperature in matter



of 45 seconds. With conventional electrical resistance heating, it would take about two and a half hours to get to the temperature,” he points out.

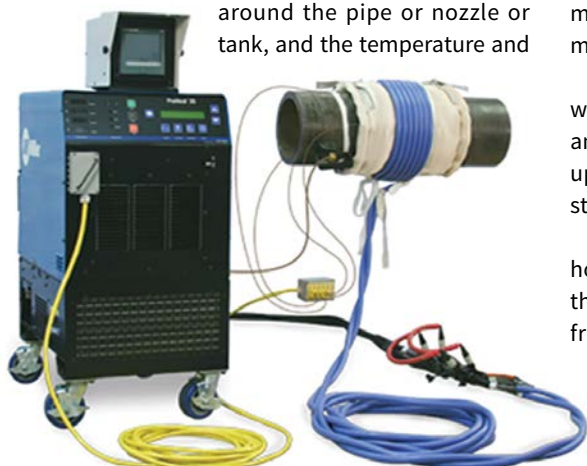
He describes a recent turnaround success at a refinery in South Africa. “On each cycle of each piping section sent for treatment, we saved them four hours: because the setup time is quicker, and getting to the control temperature is much quicker. The heat treatment cycle time is what it is – the controlled heating rate, soaking time at temperature and the controlled cooling rate are fixed and cannot be improved. But it's also much quicker to strip the induction heating system after the job has returned to a safe handling temperature,” he points out.

“We can do huge fabrications using pancake type coil set-ups. We simply shoot thermocouples onto places where we need them, then we place insulation over the treatment areas and simply lay the coils over the top of the insulation. The coils remain cold on top, and they heat the steel below through the insulation,” he says adding this makes working in the area much more convenient for operator and welders.

Highlighting some real-world data based on a heat treatment comparison of 300 welds using induction heating and electric resistance heating, he says that the number of welds processed per 12-hour shift using induction heating was 7, compared to 4 welds per shift for resistance heating. “Total shift requirements to complete 300 welds with one crew would be, for induction heating: 43 shifts; and for resistance heating: 75 shifts, so a total of 32 shifts were saved by switching to induction heating,” notes Naicker.

“This highlights a big opportunity for anyone wanting to switch to induction heating,” he concludes.

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Induction heating can easily be localised to a small area of a fabrication.

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